Precision Cooling
For *Business-Critical Continuity™*

Liebert® iCOM®

User Manual -Intelligent Communications & Monitoring for Liebert Challenger 3000™, Liebert Challenger ITR™ , Liebert CW™, Liebert DS™ Liebert PeX™ with Software Version PA1.04.033.STD

EMERSON
Network Power

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1.0 INTRODUCTION

The Liebert iCOM offers the highest capabilities in unit control, communication and monitoring of Liebert mission-critical cooling units.

Liebert iCOM may be used to combine multiple cooling units into a team that operates as a single entity, enhancing the already-high performance and efficiency of Liebert's units.

Liebert iCOM is available as a factory-installed assembly or may be retrofitted on existing products with SM, AM or AG controls. Large graphic display wall-mount versions of the control are available for remote operation and monitoring of cooling units.

1.1 Features

Large and Small Displays

The Liebert iCOM is available with either a large or small liquid crystal display.

- The **Liebert iCOM with small display** has a 128 x 64 dot matrix screen that simultaneously shows two menu icons, along with descriptive text. This display is capable of controlling only the unit it is directly connected to.
- The **Liebert iCOM with large display** has a 320 x 240 dot matrix screen that shows up to 16 menu icons at a time, as well as descriptive text. This display can be used to control a single cooling unit or any cooling unit on a network, regardless of how it is connected—either integrated into a cooling unit or simply connected to the network and mounted remotely.

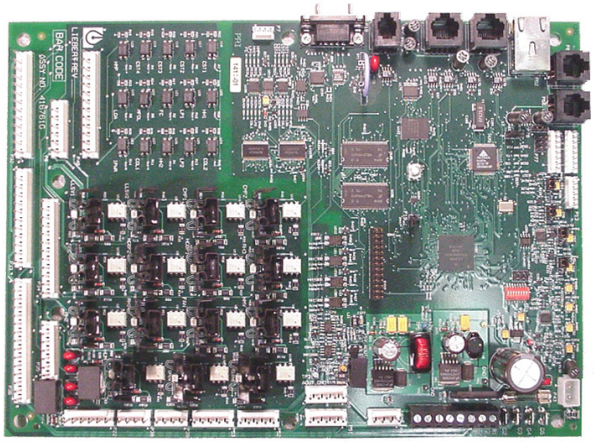
Liebert iCOM's menu-driven display is used for all programming functions on each connected cooling unit. The Status menu shows the status of the conditioned space, such as room temperature and humidity, temperature and humidity setpoints, alarm status and settings, event histories and the current time.

Figure 1 Liebert iCOM components

Wall Mount Large Display

Direct Panel Mount Large Display and Bezel

Direct Panel Mount
Small Display and Bezel

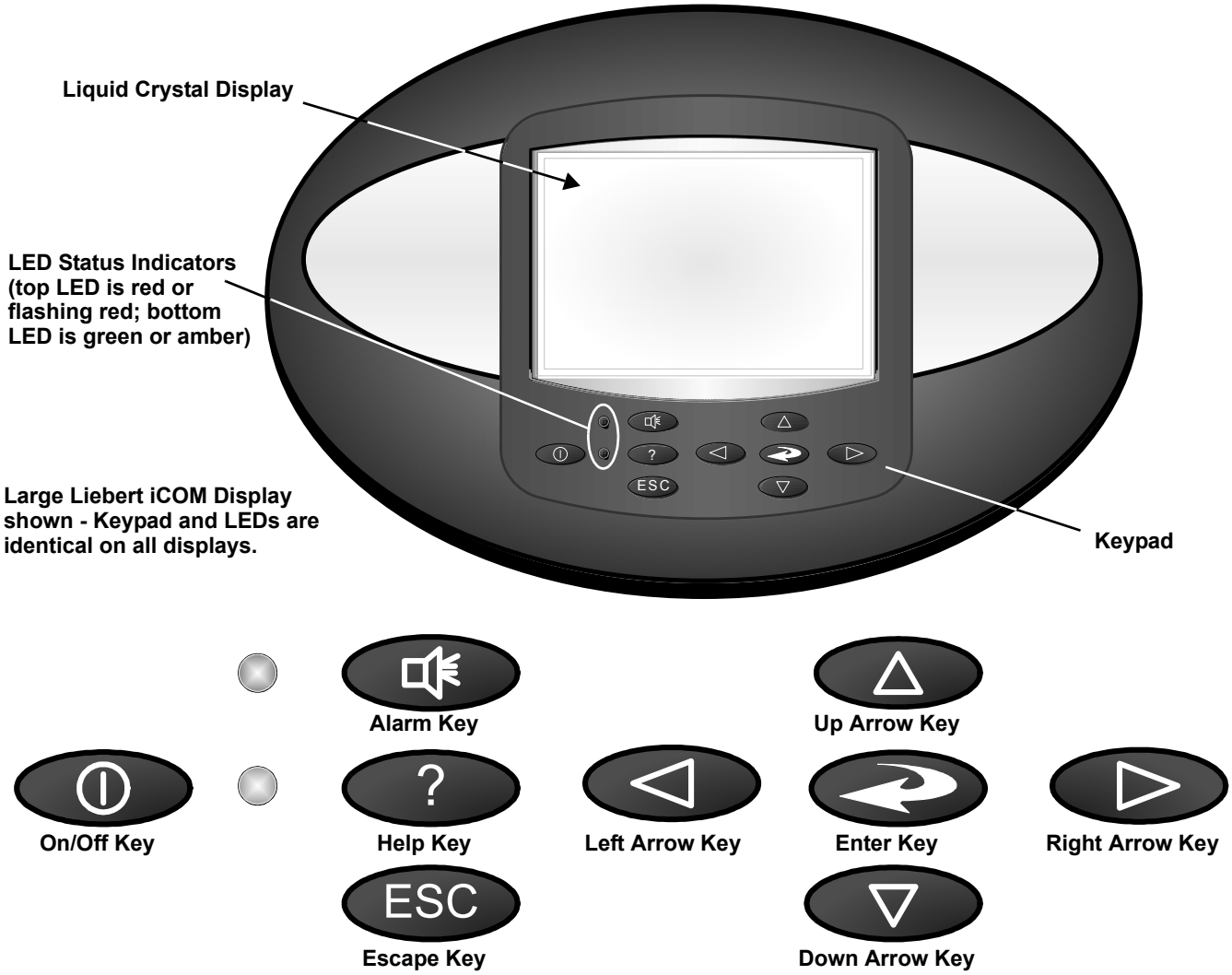


Liebert iCOM Input/Output Board

2.0 LIEBERT iCOM DISPLAY COMPONENTS AND FUNCTIONS

The small and the large display have a common key layout, as shown in **Figure 2**.

Figure 2 Liebert iCOM display components



NOTE

The Help key may be pressed at any time for a brief explanation of what is being viewed.

Table 1 Keyboard icons and functions

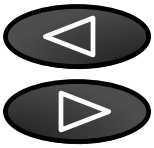
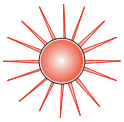
Icon	Key Name	Function
	On/Off Key	Controls the operational state of the cooling unit.
	Alarm Key	Silences/Resets an alarm.
	Help Key	Accesses integrated help menus.
	ESCape Key	Returns to the previous display view.
	Enter Key	Confirms all selections and selects icons or text.
	Increase Key (Up Arrow)	Moves upward in a menu or increases the value of a selected parameter.
	Decrease Key (Down Arrow)	Moves downward in a menu or reduces the value of a selected parameter.
	Left and Right Arrow Keys	Navigates through text and sections of the display.
	Upper LED	Blinking Red—Active, unacknowledged alarm exists
		Solid Red—Active, acknowledged alarm exists
	Lower LED	Amber—Power is available to the unit, unit is NOT operating
		Green—Power is available to the unit, unit is operating

Figure 3 Status menu, large display, graphical view

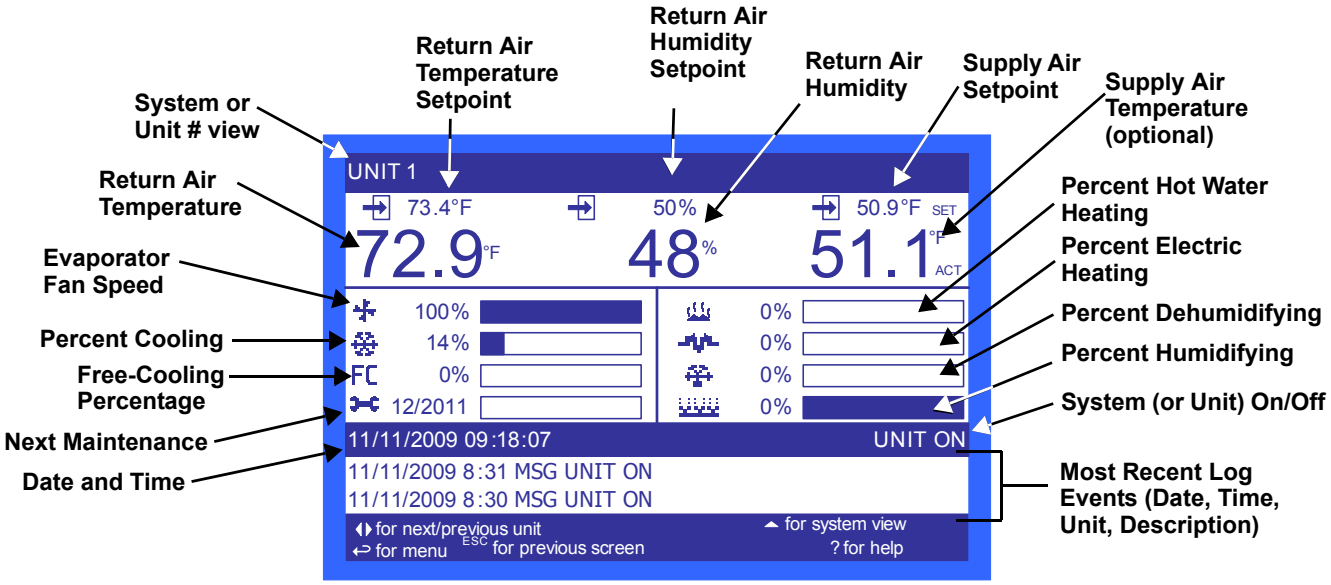
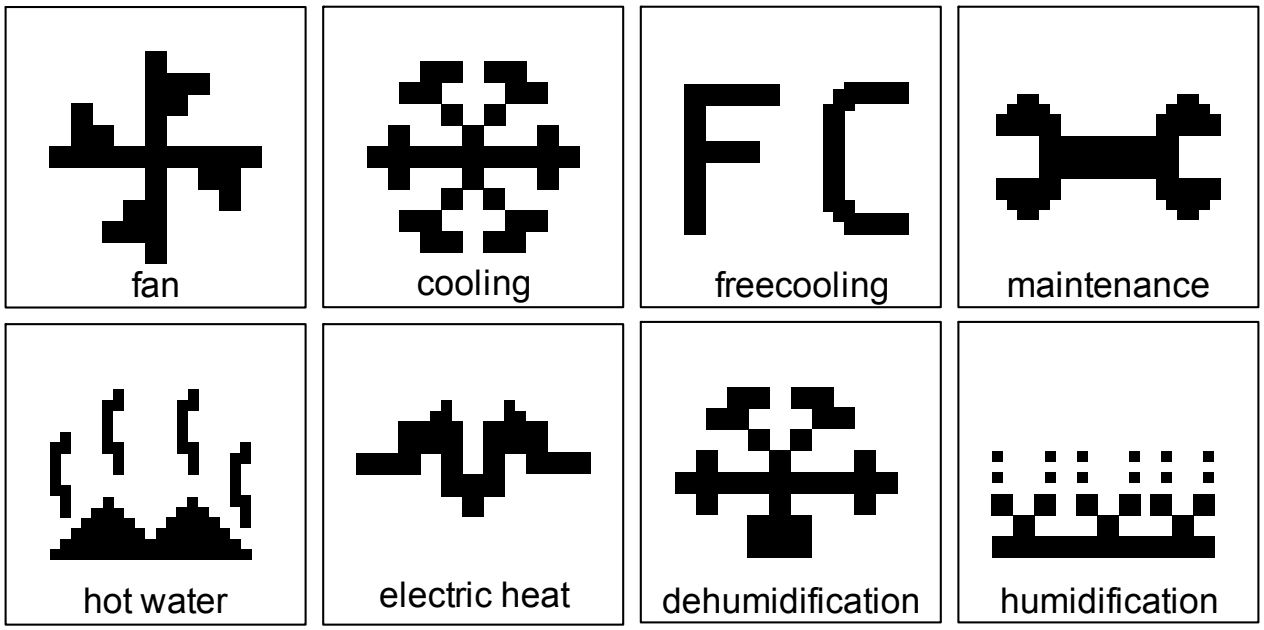


Figure 4 Liebert iCOM default screen symbols



2.1 Navigating Through the Liebert iCOM Menus

Liebert iCOM shows icons and text for monitoring and controlling your Liebert cooling units or network of cooling units. The number of icons and amount of text shown depends on the display size.

2.1.1 Control Interface

When the buttons on the Liebert iCOM have not been pressed for a short period, the display backlight turns off. Pressing any key will turn the backlight on (wake up the screen) and display the Status menu of the last cooling unit viewed. The Status menu will show the cooling unit's operational mode(s), return air temperature and humidity readings, temperature and humidity setpoints and any active alarm conditions.

If the cooling unit has a large display and is not on a network, or if the unit has a small display, whether it is networked or stand-alone, the Status menu will display only that cooling unit's information. Any large display that is connected to a network can be used to view any cooling unit on the network or show an average view of the entire system of cooling units.

The Liebert iCOM has three main menus; User, Service and Advanced.

The User menu contains the most frequently used features, settings and status information. The Service menu contains settings and features used to set up unit communications and for unit maintenance. The Advanced menu contains settings used to set up the unit at the factory.

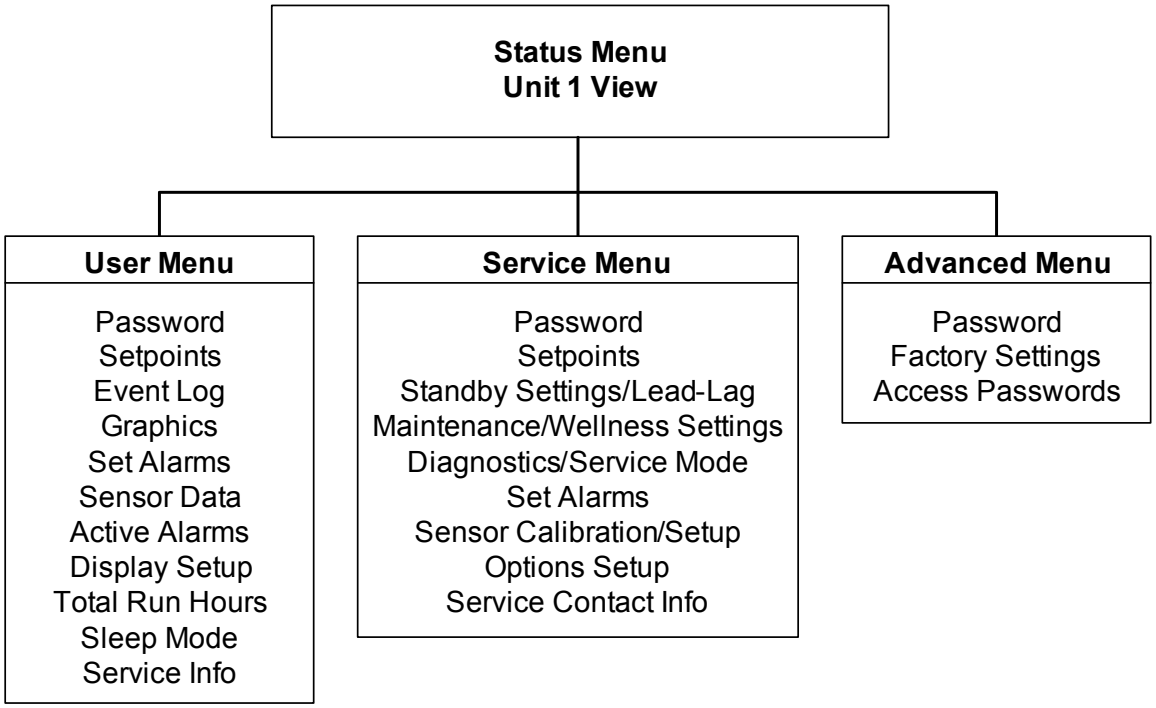
NOTE

Menu settings may be viewed without a password, but changing settings requires a password. The password for the User menu is 1490. The password for Service menu is 5010. For details on entering a password, see ***Entering a Password on page 6***

2.1.2 Accessing Submenus

While the display is at unit status screen, press either the Enter or down arrow key to display the User menu. To access the Service menu, press the right arrow key. Pressing the right arrow key again will display the Advanced menu. For navigating to the sub-menus from each main menu, press Enter key and then the appropriate arrow key. Pressing the Enter key again to access the menu items.

Figure 5 Menu tree—Small display, stand-alone or networked



Accessing Submenus on Small Displays

For navigating to submenus while at the main menu (User, Service or Advanced), use the up and down arrow keys to scroll through the icons page-by-page. To scroll through the icons one-by-one, press the enter key and then use the up and down arrow keys. With the desired icon highlighted, press the enter key to enter that submenu. Once in a Submenu, a list of menu items, each with its associated parameter, is displayed.

Press the enter key and use the up and down arrow keys to navigate through the parameters one-by-one. Pressing the Esc key will go back a level. **Figure 5** shows the Liebert iCOM menus for a small display.

Accessing Submenus on Large Displays

Press the enter key from the main iCOM display to access the User, Service and Advanced menus. Then use the left / right arrows to move among the User, Service and Advanced menus. Press the enter key to highlight the first icon. Use the arrow keys to navigate through the icons. With the desired icon highlighted, press the enter key to enter that submenu. Once in a Submenu, a list of parameters will be displayed.

The up and down arrow keys may be used to scroll through the parameters page-by-page if the submenu has multiple pages. To scroll item-by-item, press the Enter key and then use the up and down arrow keys. Using the right or left arrow keys on large displays attached to a network will change the unit being viewed. Pressing the Esc key will go back a level. **Figures 7** and **8** show the Liebert iCOM menus for a stand-alone large display and for a networked large display, respectively.

NOTE
Settings are readable without a password, but changing settings requires a password.

2.1.3 Entering a Password

The password must be entered before any value of the menu item parameter can be changed. There are three levels of password for preventing unauthorized changes. Entering the User menu password allows the operator the ability to change the parameters in the User menu. The Service menu password enables the operator to changes parameters in both Service and User. The Advanced menu password allows the changes to be made in all parameters.

The User menu password is 1490; the Service menu password is 5010.

NOTE
Entering the Service menu password permits access to both the User and Service menus.

To enter a password:

1. Navigate to the menu that contains the parameter to be changed.
2. Select *Password* in the submenu by pressing the Enter key
3. Press the Enter key to move your cursor to the right side of the screen to select the question marks.
4. Use the arrow keys to enter the numeral for the password's first digit (the up arrow key moves from 1 to the next digit).
5. Use the right arrow key to move to the next question mark and repeat **Step 4** to enter all digits in the password.
6. After entering the password, press enter.

If the password is correct, the *Actual Level* shown to the right of *Password* will change from 0 to 1 or 2. The menu will remain locked if the password was incorrect.

NOTE
Returning to the Status menu will require re-entering a password to make changes.

Figure 6 Entering a password

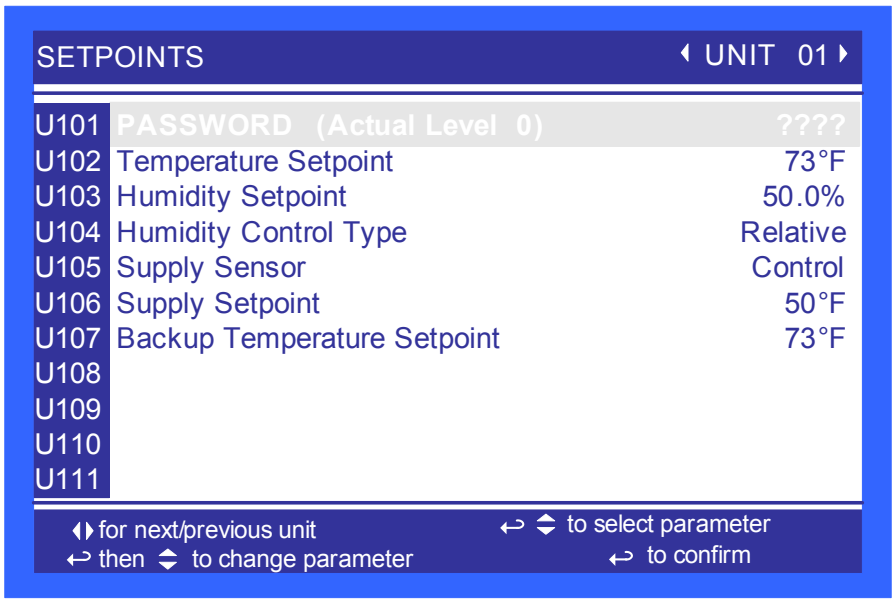
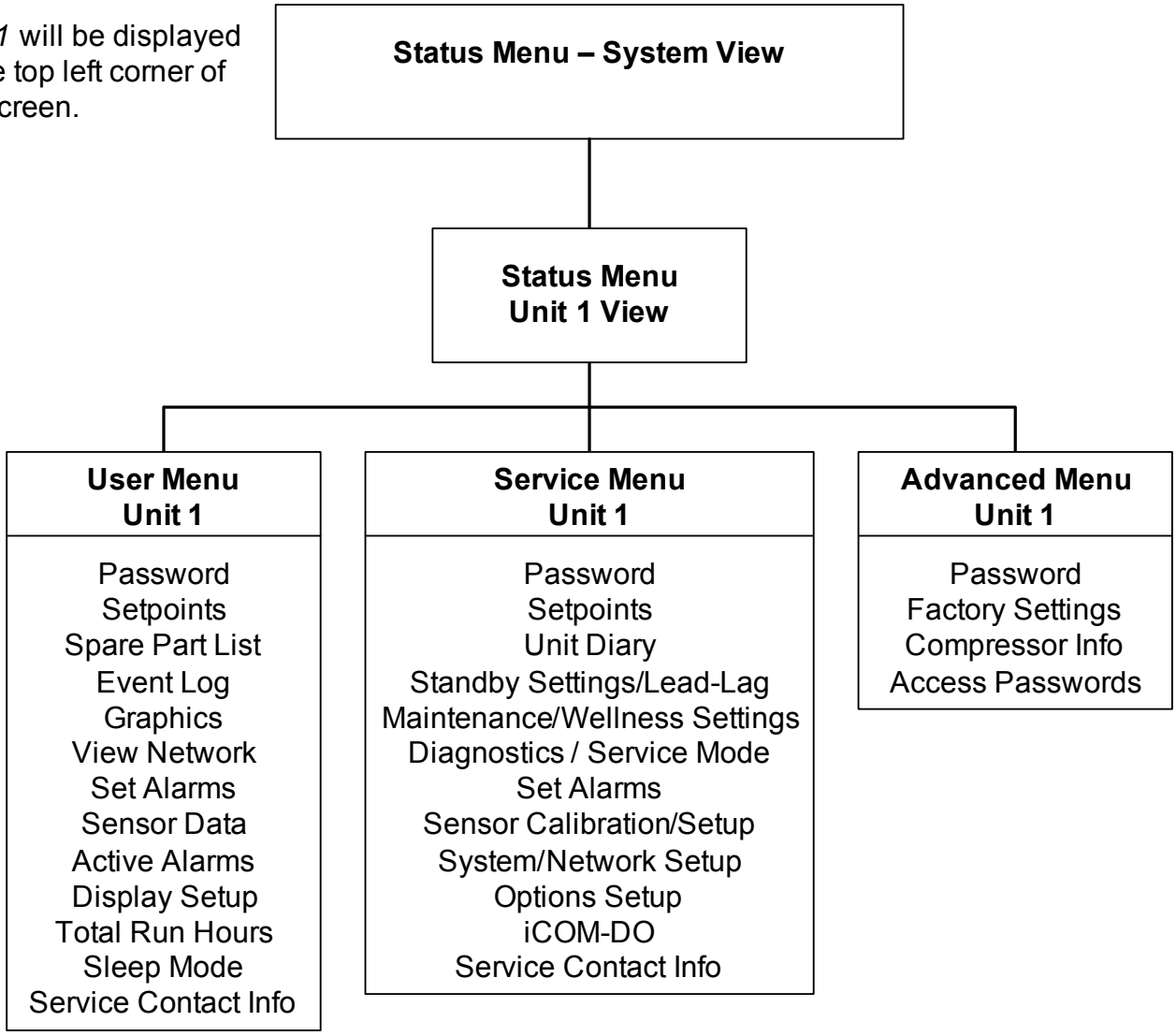


Figure 7 Menu tree—Large display, stand-alone

Unit 1 will be displayed in the top left corner of the screen.



2.1.4 Viewing Multiple Units with a Networked Large Display

When you first wake up the control, press the Esc key to return to the System view Status menu. This view shows an average of all the units on the network and any alarms present. To view a specific unit on the network, press either the enter key or down arrow key. When you do this, you will see the word *System* in the top left of the screen change to a unit number. Using the left and right arrow keys you can toggle through the various units on the network. To go back to the System view, or back one level from any menu in the control, press the Esc key.

Figure 8 Menu tree—Large display, networked

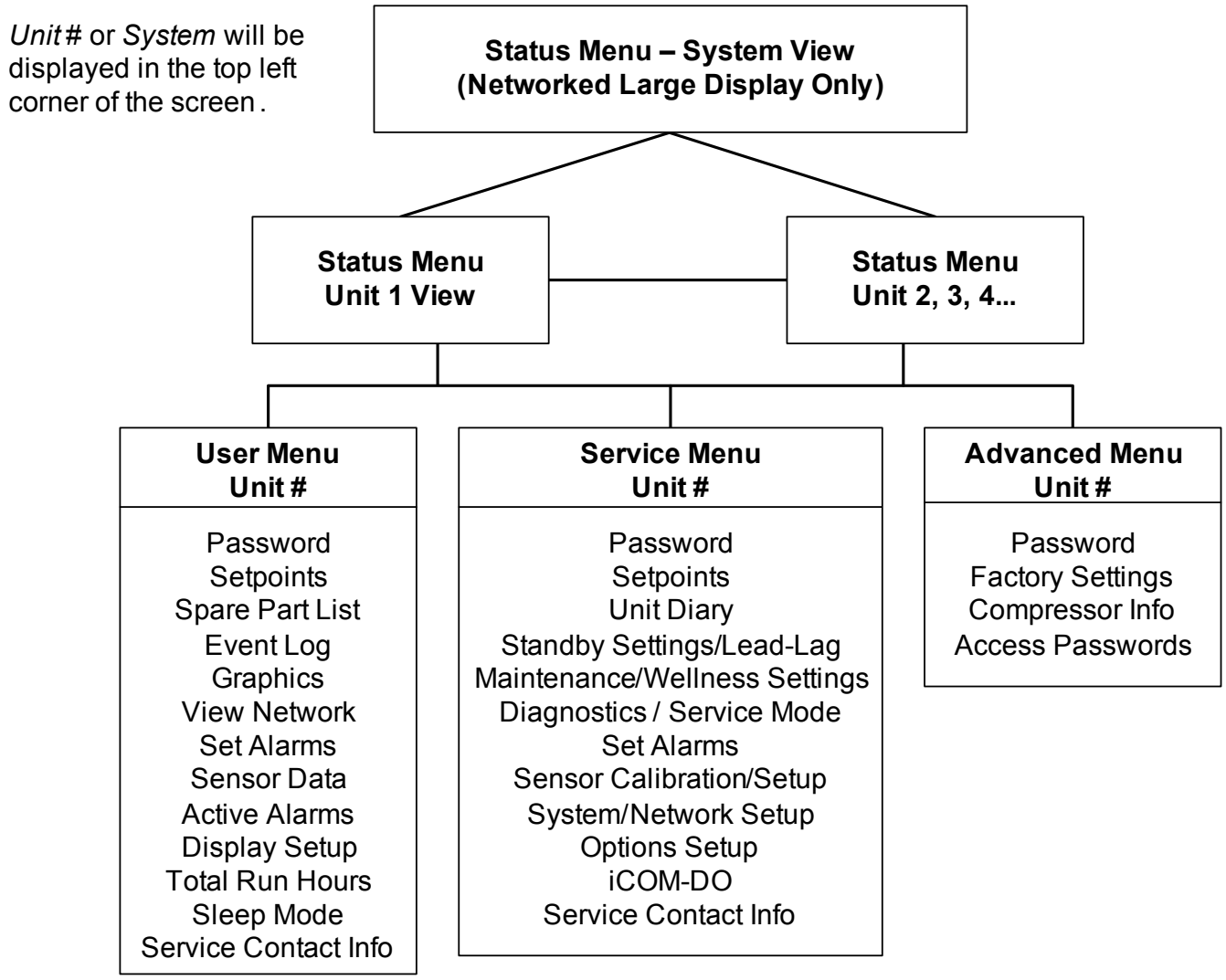
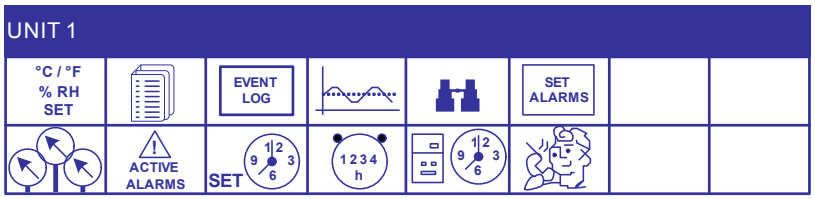


Figure 9 User menu icons



User Menu password: 1490

Table 2 User menu icons

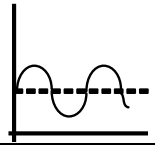
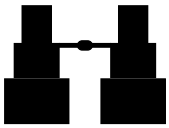
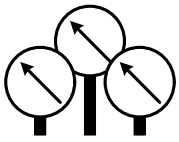
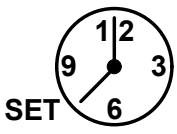
Icon	Name	Description	Available On Display
°C / °F % RH SET	Setpoints	View and change temperature and humidity setpoints	Small & Large
	Spare Part List	Displays the various part numbers of the components/parts in the cooling unit	Large
EVENT LOG	Event Log	Contains last 400 events	Small & Large
	Graphics	Displays temperature and humidity graphs	Small & Large
	View Network	Shows status of all connected units	Large
SET ALARMS	Set Alarms	Allows enable, disable and settings for alarms	Small & Large
	Sensor Data	Shows readings of standard and optional sensors	Small & Large
 ACTIVE ALARMS	Active Alarms	Allows the user to view all current active alarms	Small & Large
 SET	Display Setup	Change settings for display: language, time, simple or graphic view	Small & Large

Table 2 User menu icons (continued)

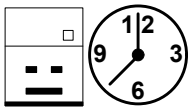
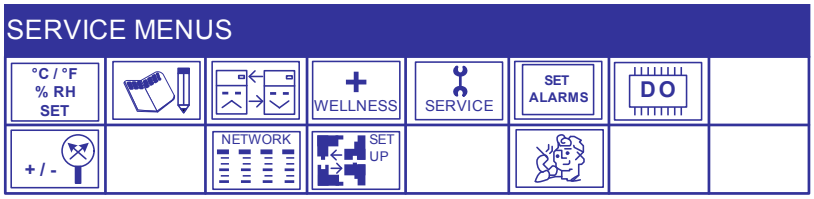
Icon	Name	Description	Available On Display
	Total Run Hours	Records the run time of all components and allows setting of limits on run time	Small & Large
	Sleep Mode	Allows setback settings for non-peak operation	Small & Large
	Service Contact Info	Contains key contact information for local service, including names and phone numbers	Small & Large

Figure 10 Service menu icons



Service Menu password: 5010

Table 3 Service menu icons

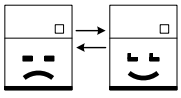
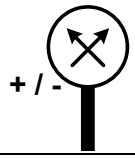
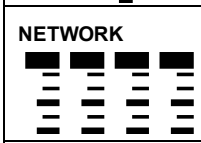
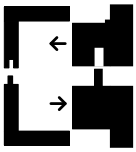
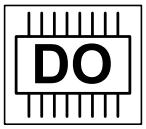
Icon	Name	Description	Available On Display
°C / °F % RH SET	Setpoints	To view and change temperature and humidity setpoints	Small & large
	Unit Diary	Shows all entered program changes and maintenance performed on the unit	Large
	Standby Settings/ Lead-Lag	Allows lead/lag setup when multiple units are connected	Small & large
 WELLNESS	Maintenance/ Wellness Settings	Allows setting maintenance interval reminder, maintenance message, number of unit starts and stops, and time since last maintenance	Small & large
 SERVICE	Diagnostics/ Service Mode	Allows troubleshooting, manual mode, read analog and digital inputs	Small & large
SET ALARMS	Set Alarms	Allows enable, disable and settings for alarms	Small & large

Table 3 Service menu icons (continued)

Icon	Name	Description	Available On Display
	Sensor Calibration/Setup	Allows calibration of sensors	Small & large
	System/Network Setup	Allows setup and U2U communication for multiple units	Large
	Options Setup	Allows setup of component operation	Small & large
	Service Contact Info	Contains key contact information for local service, including names and phone numbers	Small & large
	iCOM-DO	Change settings for Liebert iCOM Discrete Output card	Large

3.0 OPERATION

The Liebert iCOM display provides viewing, trending and configuration capability for Liebert cooling units. All unit settings and parameters can be viewed and adjusted through three menus: User, Service and Advanced. All active alarms are displayed on the LCD and annunciated.

The control is shipped from the factory with default selections for all necessary settings. Adjustments can be made if the defaults do not meet your requirements.

References to menu items in this manual are followed by the main menu and the submenu where they can be found.

For example:

- **Temperature Setpoint (User Menu, Setpoints)** - The Temperature Setpoint parameter is located in the User menu under the Setpoints submenu.
- **High Return Humidity (Service Menu, Set Alarms)** - The High Return Humidity alarm is located in the Service menu under the Set Alarms submenu.

3.1 Single Unit Functions

3.1.1 Unit/Fan Control

Start - Stop

The fan output is first activated when the unit is switched On. The unit can be switched On and Off from two inputs:

- Remote Off - Remote shutdown terminals will turn off the connected unit thus displaying remote off on the front display. This command can also be invoked from a BMS.
- Display Off - When a unit is turned off from the System Screen of a large display, Display OFF is shown for unit status.
- Local OFF - When a unit is turned Off from the Unit Status Screen or small display, Local OFF is shown for unit status.

Pressing the On/Off key on a small display will affect only the cooling unit it is mounted on, regardless of whether the cooling unit is a stand-alone unit or part of a network. The small Liebert iCOM display does not have access to the Unit-to-Unit network.

NOTE
Pressing the On/Off key on a large display of a stand-alone cooling unit will control only that unit.

The effect of pressing the On/Off key on a large display connected to a network depends on the view: System or Unit.

- In System view, pressing the On/Off key shows a warning asking for confirmation to **shut down the entire system**.
- In Unit view, pressing the On/Off key affects only the unit being viewed, without a confirmation request.

Each time a unit is powered on or off, an event is added to the Event Log in the User menu.

NOTE
Customer switches: remote On/Off (if used) and display On/Off switches are in series. A cooling unit will start only if both switches are On; if one of these switches is Off, the unit will stop. Safety devices within the unit are also in series and will shut the unit down if applicable.

Figure 11 Start-stop priority switches

NOTE
If Remote On/Off is not used, a jumper is inserted to bypass the switch.

Autorestart

When input power returns after a power failure, the unit will return to its previous operating status: On if it was On before the power failure, Off if it was Off.

When power returns, the autorestart time—time-selectable: Single Unit Auto Restart (Service Menu, Options Setup)—will determine how quickly the unit restarts. If the units are on the same network, the autorestart time runs in a loop, starting each unit in sequence, beginning with Unit # 1.

Loss of Power Alarm

A Loss of Power Alarm is activated when power is restored after an interruption. If acknowledged, the alarm resets automatically after 30 minutes. This alarm can be set to different event types (Message, Alarm or Warning) and can be disabled under menu item Loss of Power (Service Menu, Set Alarms).

NOTE
Loss of Power alarm will be activated only on units that had the fan switched On before power was lost.

Fan Alarm / Fan Protection Settings

The fan operation is protected by two digital devices: motor protection (optional) and a differential pressure switch. The motor protection monitors for main fan overload (Main Fan Overload alarm) or EC fan fault and the differential pressure switch detects a loss of airflow. If either protection device is activated after an adjustable time delay, an audible alarm occurs, an alarm relay activates and an event is recorded in the event log (Main Fan Overload and Loss of Airflow in Service Menu, Set Alarms).

The fan delay at the unit start is always five seconds shorter than the control delay (to avoid short-cycling components when the fan is not working).

There are two selection possibilities for both, Loss of Airflow and Main Fan Overload:

- **Shutdown**—stops the unit (intended for DX models).
- **Disable**—disables humidifying, heating and dehumidifying outputs; allows cooling and free-cooling only (intended for chilled water models / external cooling).

NOTE
When the Main Fan Overload alarm is active, the Loss of Airflow alarm is masked out.

Chilled Water Units with Variable Fan Speed—EC or Variable Frequency Drives

Parameters related to VSD fan speed setting can be found in the Service Menu / Setpoints submenu on page 5 of 6. This menu allows the cooling unit's fan motor speed to be configured and adjusted for a variety of applications.

- **Auto Operation**: When set to Auto, the speed of the fan motor follows the position of the chilled water valve based on predetermined logic for cooling and dehumidification operation. Auto operation can be set with either return or supply air control. An exception is when the supply sensor is set to Cooling Only. During this operation with the VSD Fanspeed set to Auto, the chilled water valve is controlled by the supply sensor and the fanspeed is controlled by the return sensor and its associated control mode settings.
- **Manual Operation**: When set to Manual, the speed of the fan motor follows user input as set either locally at the Liebert iCOM display or remotely via Modbus communication, which works in conjunction with an optional Liebert IntelliSlot® 485 card.
- **Economy Operation** (free-cool or dual-cool units only): When set to Economy, the speed of the fan motor follows the Free Cooling or Dual Cool water valve. The fan speed output latches to percentage value set at STD setpoint (Service Menu, Setpoints) when a compressor activates to prevent the DX system from operating at low evaporating pressure, which might cause the coil to freeze.
- **Delta Operation**: When set to Delta, the fan speed modulates in relation to two temperatures that are read from a sensor board, which is optional. The sensor temperature readings will be compared and a delta between the two sensors will be determined. The delta of the two sensors will be compared to the fan speed delta setpoint and will determine the correct fan speed. This control can be adjusted using the Fan Speed P-Band and the Fan Speed Integration to determine the rate of change based on the sensor delta. Delta operation enhances air flow control when a containment solution is being utilized. This is accomplished by maintaining the correct airflow based on the inner and outer containment temperatures.

Additional fan speed configuration parameters include a fan speed filter and fan speed reposition delay timer. These parameters allow fine tuning of the fan speed control and, except for setting to Manual, are applicable to any other operation mode set in the VSD fan speed setting.

- The fan speed filter allows the fan to respond at a different rate depending on the location of the control point within the proportional band.

  Example: *When the controlled temperature is near the setpoint or at conditions where the proportional band output is decreasing and approaching 0%, the fan speed change rates are proportionally decreased to avoid overshooting the controlled temperature. However, when the temperature rises above the setpoint or at conditions where the proportional band output is increasing, the fan speed change rates are proportionally increased.*
- The fan speed reposition delay timer setting in the Liebert iCOM menu can be changed to improve the fan operation stability if it is oscillating. The delay timer holds back the fan output change until each delay period is reached if fan speed is decreasing. If fan speed is increasing, then the delay timer has no effect.

NOTE

- *The fan speed lower and upper limit settings are normally set at the factory.*
- *The standard fan speed control will be overridden during a call for Dehumidification. When there is a call for Dehumidification, the fan speed will change to the VSD Setpoint Dehum parameter found in the Service Menu, Setpoints.*
- *The standard fan speed control will be overridden during a call for Humidification or Reheat. During a call for Humidification or Reheat, the fan speed will change to a higher speed, which is set at the factory to eliminate the possibility of condensation or damage to the unit.*

VSD Setpoint (VSD Fan Speed Setting)

If the VSD Fan Speed Control (Service Menu, Setpoints) is set for Manual, the VSD Fan Speed Setpoint (Service Menu, Setpoints) may be set for the desired speed of the variable speed motor.

Depending on the product control design, there may be an internal minimum speed, as defined by that specific product operation, while the customer input may be set for 0-100%:

- Fan speed may be set locally at the unit using the Liebert iCOM display.
- Fan speed may be set remotely via a BMS signal (sent via Modbus using an optional Liebert IntelliSlot 485 card), which then transmits to the unit local control.

3.1.2 General Compressor Requirements

Low-Pressure Time Delay

When the compressor starts, the low-pressure input is ignored for a selected period of time based on the setting of the Low Pressure Alarm Delay (Service Menu, Options Setup). This time is usually set to 3 minutes on air-cooled units, and to 0 or 1 minute on water cooled units. When this time is expired, a second timer starts to operate if the low-pressure input is active. This second timer is active during normal compressor operation to avoid compressor trips due to bubbles in the refrigerant or other influences creating short trips of the low-pressure switch. The low-pressure device input is ignored if the compressor is not operating. Exception: Pump Down (see **Pump Down**).

NOTE
Low-pressure condition could be read through contacts or through pressure transducers with threshold setting.

Pump Down

Pump Down is applicable to compressorized systems if equipped for pump-down operation, which is set at the factory. This operation prevents the compressor oil from being diluted with liquid refrigerant to ensure that the compressor is properly lubricated for the next startup.

The Pump Down operation operates in the following manner:

Whenever the control determines that no more cooling is required and a compressor needs to be shut off, the liquid line solenoid valve (LLSV) is closed (de-energized). The compressor will continue to operate until the low suction pressure device (LPS or LPT) opens, which shuts off the compressor. If the LP device does not open within a specified time, the LLSV is turned On, then back Off (the assumption is that the LLSV is stuck). If, after three times, the LP device does not open, the compressor and LLSV are locked off and an alarm “Pump Down not completed” will appear.

There is a re-pump down if the LP device opens again after the compressor has been already stopped—a maximum of six re-pump-down cycles per hour are allowed. At the seventh request of re-pump down the alarm “Comp 1 Pumpdown Fail” or “Comp 2 Pumpdown Fail” will appear and the compressor will be locked out.

Pump down is always performed loaded (for compressors with unloaders: unloaders off, digital scroll: control solenoid valve disabled).

For digital scroll only: when pump down has finished successfully (LP device opened), pump down will be continued for another half-second with the control solenoid valve energized.

High Pressure Alarm

When the compressor is initially activated, the system will be monitored for a high pressure situation. When a high pressure situation is detected during the first 10 minutes of operation, the unit will attempt to correct the problem several times without notification. If the unit is unsuccessful in correcting the problem, an alarm will occur and the affected compressor will be locked off. If high head pressure alarm trips three times in a rolling 12 hour period, the affected compressor will be locked off.

After the compressor has been running for 10 minutes, if a high head pressure situation is detected, an alarm will occur and the affected compressor will be immediately locked off without the unit trying to correct the problem.

Once the compressor is locked off, it will not come back on until main power is reset, or until the HP Alarm Counters (Service Menu, Diagnostics) are reset to 0. Setting the counter to 0 will auto-reset the alarm without the need of pressing the reset button on the display. Even if the pressure in the system drops below the alarm point, the compressor will remain off until the system is reset.

NOTE

If the unit is equipped with manual reset high head pressure switches, or if the auto reset high head pressure switches don't reset, the compressor will not be turned back on, but there will be a 30-second delay from when the high head pressure situation occurs and when the alarm is annunciated.

Digital Scroll High Temperature

A protective maximum operating compressor temperature limit is imposed on units with digital scroll compressor(s) with thermistor. If the digital scroll temperature reaches the maximum temperature threshold, the compressor will be locked out for at least 30 minutes and an alarm will be annunciated. If after 30 minutes the temperature has cooled to a safe operating temperature, the compressor will resume operation.

Each time a high-temperature alarm occurs, HT 1 Alarm Counter (Service Menu, Diagnostics) or HT 2 Alarm Counter (Service Menu, Diagnostics) is increased by one. Once these counters reach five occurrences in a rolling four-hour period, the compressor will be locked out. The alarm can be reset once the temperature returns to a safe level by:

1. Setting the counter back to 0 from the display and pressing the alarm reset button.
2. Shutting off power to the control board by turning the cooling unit's main power disconnect switch Off and On.

3.1.3 Compressor Timing—Short-Cycle Protection

To help maximize the life of your compressor(s), there is a start-to-next start delay for each single compressor.

NOTE

This delay may cause a short cycle if there is a very light room load. A short cycle means that the compressor has cycled On and Off 10 times in the past hour. Should this occur, contact your local Emerson representative to adjust the minimum compressor off delay.

3.1.4 Compressor Sequencing on Two-Compressor Units

Compressor Sequencing parameter (Service Menu, Options Setup) is intended to maintain equal run times between compressors. This setting has three selection possibilities:

- Always use Compressor 1 as lead compressor
- Always use Compressor 2 as lead compressor
- Auto:
  - First priority: if the safety timings are acceptable for only one compressor, then it is the next to be started/stopped.
  - If both compressors are off: the one with fewer working hours is the next to start.
  - If both compressors are in operation: the one that has been operating longer since the last start is the next to be stopped.

NOTE
The Auto setting attempts to maintain equal run times between compressors.

3.1.5 Motorized Ball Valve in Water-Cooled Units

On water/glycol-cooled units, discharge pressure is controlled by a motorized ball valve (MBV). During unloaded operation, pressure changes during each digital cycle could cause a pressure-controlled water regulating valve to open and close an excessive number of times. The motorized ball valve is designed to maintain a consistent peak discharge pressure.

The control algorithm for the motorized ball valve uses an intelligent sampling rate and adjustable pressure thresholds to reduce the number of times the valve opens and closes. The valve assembly consists of the brass valve, linkage and actuator.

Each compressor has one motorized ball valve that is driven by the analog output of the Liebert iCOM based on discharge pressure. If there is a call for cooling, the compressor start is delayed by a 30-second timer. During this delay, the motorized ball valve is set to 50% open to allow fluid flow through the unit condenser. The compressor will start after the 30-second timer elapses.

Motorized Ball Valve Manual Mode: (Service/Service) Manual operation can be selected to allow service personnel to control the motorized ball valve from the Liebert iCOM.

When Auto BV Control is selected, the motorized ball valve functions as it would be during normal system operation.

NOTE
Compressor operation will be delayed 30 seconds to allow the motorized ball valve to position itself for initial startup.

When Manual BV Control is selected, the user must be careful in setting the MBV position because the ball valves will remain in the position set in the Service menu until the control is switched back to Auto or until a technician changes the valves to another manual position (the motorized ball valve in manual mode can be set in 1% increments from fully closed to fully open). Low- or high-discharge pressure may occur during this mode, depending on environmental conditions and the position of the motorized ball valve.

The motorized ball valve is driven by a 2-10VDC proportional control signal: the valve is closed at 2VDC, 50% open at 6VDC and fully open at 10 VDC.

3.1.6 MBV Operation After Compressor is Turned Off

Once a compressor has stopped, the MBV control will continue to change the MBV position to maintain system pressures for a maximum time of 10 minutes by following the Auto BV control algorithm. When the 10-minute delay has expired or the discharge pressure is below its minimum threshold the motorized ball valve will close until the next compressor activation.

3.1.7 Service Offset—Changing System Pressure Settings

The MBV control is set to maintain a system pressure specific to the particular type of cooling unit. A properly trained and qualified technician can increase or decrease the pressure through the Ball Valve Setpoint Offset found in the Service/Options Setup menu. The range is 0 to 50 PSI; the default is 30 PSI.

NOTE

Adjusting this parameter will increase or decrease the operating compressor discharge pressure by changing the targeted range of control. The discharge pressure is the peak pressure of the digital cycle.

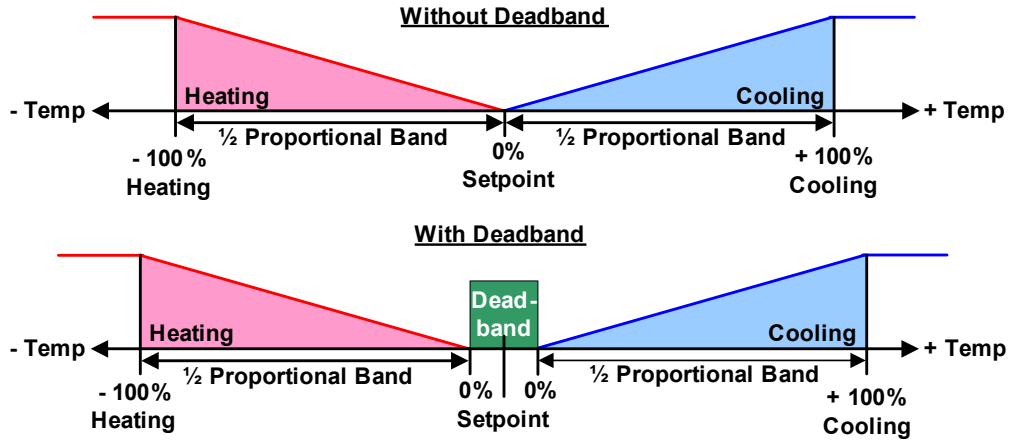
3.2 Temperature Control—Single Source Cooling (No Extra Cooling Coil)

3.2.1 Temperature Proportional Band

The control uses the temperature proportional band to determine which operation to perform (cooling/heating) and how much capacity to provide. The Temperature Proportional Band is a user-defined range that is divided into two equal parts for cooling and heating. The Temperature Setpoint is between these two equal parts.

An optional Temperature Deadband range can be defined, which is equally divided on either side of the setpoint and separates the two halves of the proportional band. **Figure 12** illustrates how the temperature proportional band is evenly divided on either side of the temperature setpoint, with and without a deadband.

Figure 12 Temperature proportional band



The control works the same for both supply or return air control. When air temperature deviates from the setpoint, the control will bring on cooling or heating. If the actual air temperature increases, the control calls for 0% (none) to 100% (full) cooling capacity based on how much the temperature exceeds the setpoint. If the return air temperature decreases, the control calls for 0% to -100% (none to full) heating capacity based on how far the temperature is below the setpoint.

When the return air temperature reaches the end of the proportional band, either 100% or -100%, full cooling or full heating capacity is provided. No operation is performed when a 0% call is calculated or the temperature is within the deadband. The control varies the call for cooling and heating in 1% increments as the air temperature moves through the proportional band halves.

The deadband range is used to widen the setpoint. When the air temperature falls within the deadband, the control operates the same as if the temperature equaled the setpoint exactly. This setting helps maximize component life by preventing excessive component cycling.

NOTE

The temperature deadband prevents small temperature changes from activating compressors and valves.

The Temperature Proportional Band and Temperature Deadband parameters are in the Service menu under the Setpoints submenu. The Temperature Setpoint parameter is in both the User Menu and Service Menu under Setpoints.

There is a parameter AutoSet Enable (Service Menu, Setpoints), which automatically sets the proportional bands for temperature and humidity, and both the integration time factors according to the type of unit (chilled water, single or dual compressor).

NOTE

Before the proportional or integral setpoints can be changed, the Auto Set Enable must be changed to NO.

3.2.2 Compressor Control

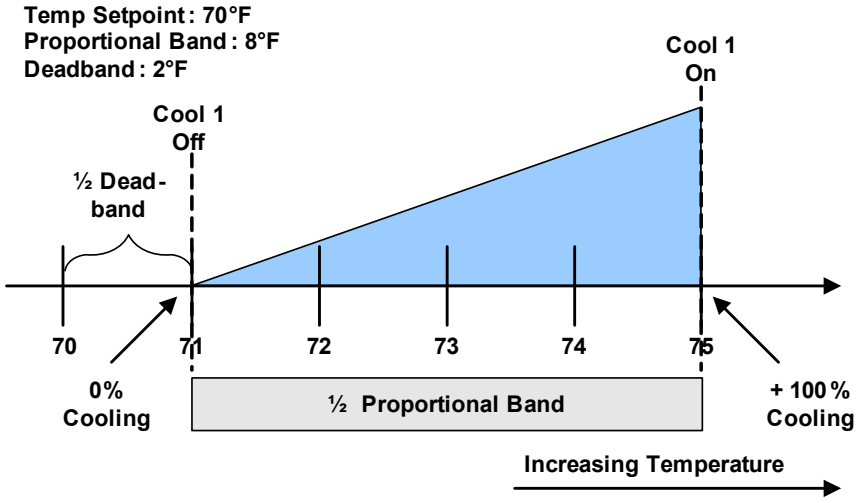
Depending on its type, a Liebert Precision Cooling unit may have one or two compressors with or without unloaders or variable capacity.

Compressor Proportional Bands

One Single-Step Compressor Without Unloaders—One-Step

One single-step compressor, Cool 1, is started at 100% call for cooling from the temperature proportional band and stopped at 0% (see **Figure 13**).

Figure 13 One single-step compressor without unloaders



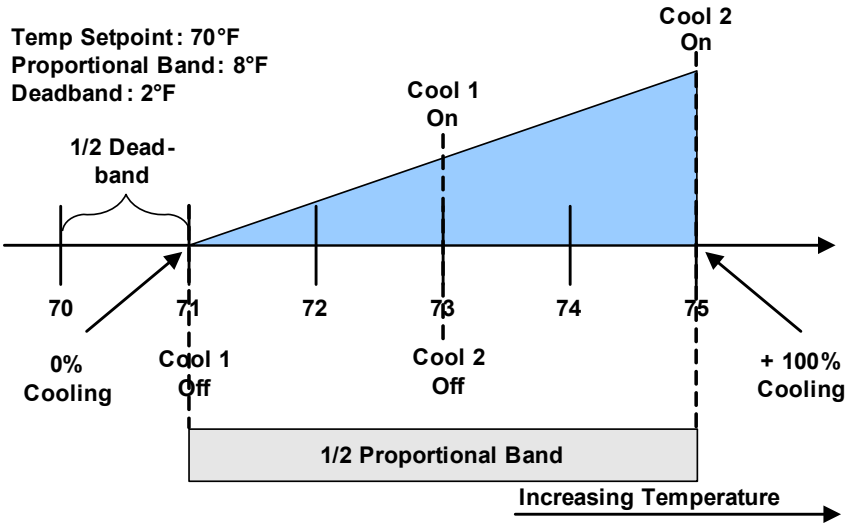
Two Single-Step Compressors Without Unloaders—Two-Step

First single-step compressor, Cool 1, is started at 50% calculated output from the temperature proportional band, and stopped at 0%. The second compressor, Cool 2, starts at 100% and stops at 50% (see **Figure 14**).

One Compressor With an Unloader—Two-Step

The two-step compressor is started unloaded at 50%, Cool 1, calculated output from the temperature proportional band and stopped at 0%. At 100% the compressor starts fully loaded, Cool 2, and returns to unload operation at 50% (see **Figure 14**).

Figure 14 Two single-step compressors without unloaders or one compressor with an unloader (two-step)



Two Compressors With Unloaders—Four-Step

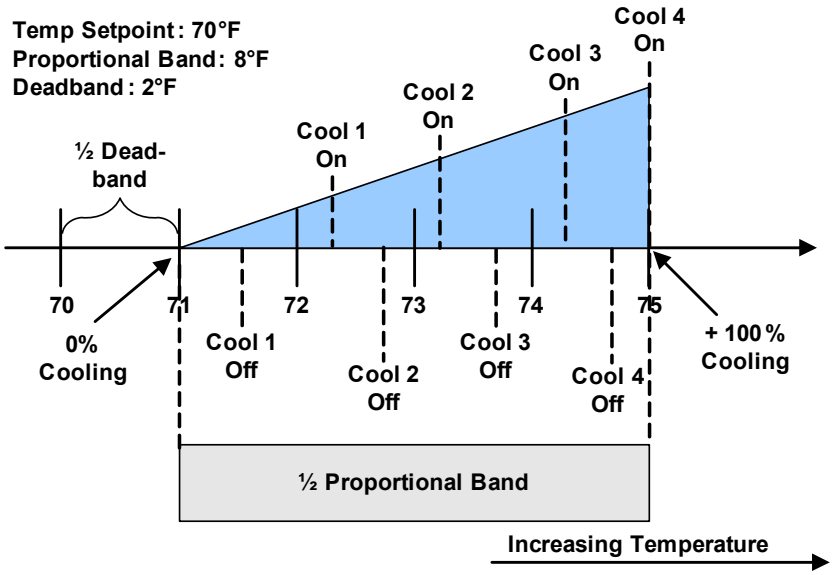
The first two-step compressor is started unloaded at 33% calculated output from the temperature proportional band and stopped at 17%. At 80% Compressor 1 will be loaded, at 70% unloaded.

The second compressor starts unloaded at 63% and stops at 47%. At 100%, Compressor 2 will be loaded, at 90% unloaded (see **Figure 15**).

The four stages of cooling are accomplished in the following manner:

- 1 stage: One compressor, unloaded - Cool 1
- 2 stages: Both compressors, unloaded - Cool 2
- 3 stages: One compressor, loaded and one compressor, unloaded - Cool 3
- 4 stages: Both compressors, loaded - Cool 4

Figure 15 Two compressors with unloaders (four-step)

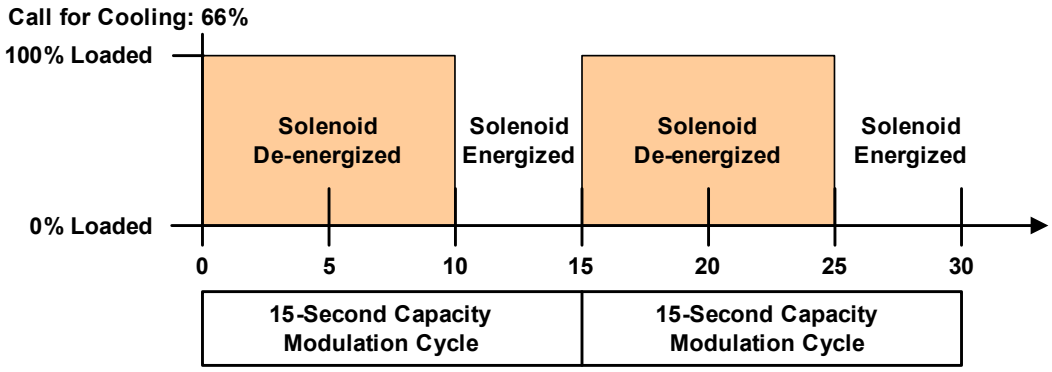


Digital Scroll Compressors

A digital scroll compressor can modulate its capacity anywhere between 10-100%. This variable capacity modulation allows cooling units to control an environment more precisely.

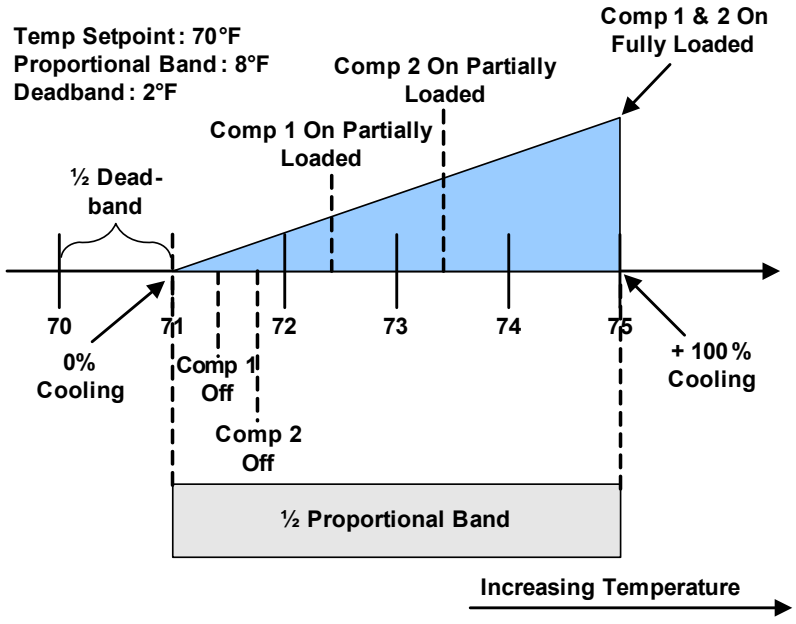
Digital scroll capacity modulation is achieved by energizing and de-energizing a solenoid valve on the compressor. When the solenoid valve is de-energized, the compressor capacity is 100%. When the solenoid valve is energized, the compressor capacity is zero. Therefore, the capacity of the compressor depends on how long the solenoid is de-energized for. If the solenoid is de-energized for 10-seconds, then energized for 5 seconds during a 15-second cycle, the resulting capacity will be 66% as shown in **Figure 16**.

Figure 16 Digital scroll capacity modulation, 10-100% variable



On single and dual digital scroll compressor systems, the first compressor is started at 25% calculated output from the temperature proportional band and stopped at 10%. On dual digital scroll compressor systems, the second compressor is started at 35% and stopped at 20%, see **Figure 17**. When a compressor is started, the solenoid is energized longer than it is de-energized to match the call for cooling. When the call for cooling increases to 100%, the solenoid is de-energized for the entire 15 second cycle.

Figure 17 Single and dual digital scroll compressor activation points



3.2.3 Chilled Water Control

The chilled water control valve is adjusted proportionally as the temperature control varies the requirement for cooling from 0% to 100%. A three-point actuator or motorized ball valve is used for chilled water cooling, as well as free-cooling hot water or heating.

The three-point actuator is driven through two digital outputs: Open and Close. The control determines the valve position by timing how long the open or closed signals have been active based on the valve travel time set in the Service menu / Setup submenu. To determine the initial position of the valve, the unit must perform a 3P Reset. The 3P Reset closes the valve for a time of 110% of the 3P Actuator run time. This calibrates the valve with the controller and ensures that it is closed. A 3P Reset is also performed if the fan is switched off for any reason (timer off, unit off, etc.). Once the reset is performed.

The three-point actuator can be configured to utilize the pre-wired feedback signal provided from the factory. Enabling the feedback signal is required when supply air control is being used with the 3P valve to increase the valve's position accuracy. Enabling the feedback signal will eliminate the need to drive the valve closed after a loss of power or Unit Off command, decreasing the unit's restart time. Authorized Emerson personnel should use the following steps to enable the feedback signal:

1. The feedback on the control valve uses Analog Input 1.
2. Nothing can be connected to Analog Input 1 P11 pins 1 through 4.
3. Control board DIP switch SW2 Switch 1 must be ON, Switch 2 must be OFF.

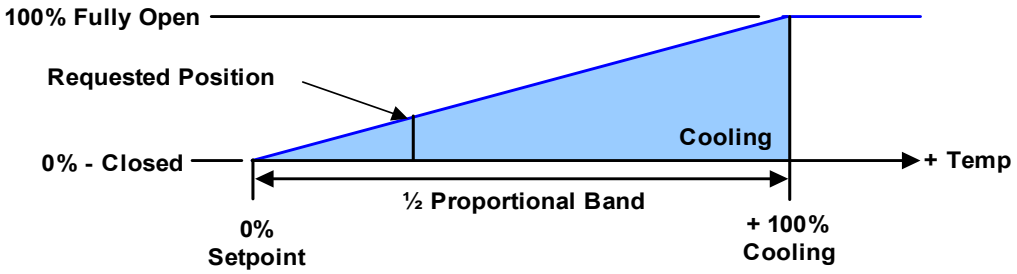
Figure 18 DIP switch locations on Liebert iCOM control board

4. P68 must have a jumper placed between the top and bottom two pins on the left side and one placed between the top and bottom pins on the right side, the two middle pins should be left unconnected.
5. Go to Service/Diagnostics Service Menu and find S379. Set this option to Feedback and note that S380 will go to Yes and S381 will go to Ongoing. If Feedback is already selected then go to line S380 and manually select Yes. This means that the Liebert iCOM is doing auto calibration on the valve using the feedback now available through the potentiometer. Wait for S381 to say *Idle* and then the process is complete.

Chilled water units that contain a motorized ball valve(s) are connected to the control by an analog output. The analog output is driven proportionally to the call for cooling as shown in **Figure 19**. Larger chill water units may contain two motorized ball valves in which both valves are controlled in parallel for cooling. The two valves may be set to Cascade mode for dehumidifying to minimize the overcooling effect during dehumidification.

NOTE
Depending on the valve specifications, the voltage output may be a 0-10VDC or a 2-10VDC that is scaled automatically within the control.

Figure 19 Chilled water valve control (example: cooling)



3.3 Temperature Control—Second Cooling Source

Certain cooling units are available with a second source of cooling within the unit. These typically are compressorized models with an additional chilled water or free-cooling coil.

3.3.1 Differential Temperatures / Controls (Comparator Circuit)

Delta T (Temperature Difference) Between Room and Glycol

The comparator circuit determines if the glycol / chilled water temperature of the second cooling source is low enough to provide at least partial cooling capacity. The comparator circuit has three settings (DT Between Room / FC Type, [Service Menu, Setpoints]):

- Disabled
- Contact
- Value

The Disabled setting is for standard compressorized and chilled water units that do not have a second cooling source. The Disabled setting can also be used to disable the second source of cooling.

The Contact setting is used when an external input is being used to determine when the second cooling source is to be activated. The external control communicates to the Liebert unit via contact closure.

- Closed = activate second cooling source control
- Open = deactivate second cooling source control

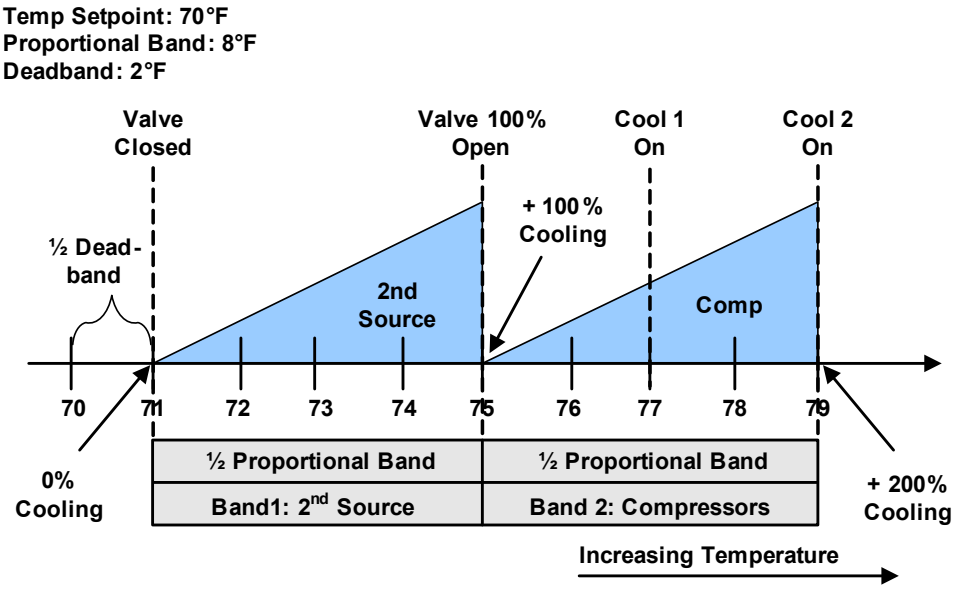
The Value setting is the factory default setting (8°F [4.4°C]) on free-cooling and dual cooling units. If the temperature difference between the second source cooling fluid parameter, Freecooling Fluid Temperature (User Menu, Sensor Data) and room air is equal to or greater than the adjustable DT Between Room Air / FC Fluid (Service Menu, Setpoints) value, then the second source cooling fluid will be used to provide at least partial cooling.

Sensors used for this delta T are: room/local sensor or the return air sensor; and the glycol sensor.

If this delta T is true, the following actions will be performed:

1. The Free-Cooling Status indication will show “On” instead of “Off”.
2. The compressor band will be shifted to the right by 100%, and within the first 100% the free-cooling valve band will take place (see **Figure 20**).
   The cooling portion of the proportional band is doubled, with the first half of the band controlling the free-cooling valve and the second half controlling the compressors.

Figure 20 Second cooling source and two-step compressorized cooling



Minimum Chilled Water Temperature—This feature permits the user to select the minimum chilled water temperature that allows simultaneous operation of the second cooling source (chilled-water valve control) and compressor control. This feature is enabled in the Service menu under Setpoints, parameter Minimum CW Temp.

If the water temperature is below this minimum chilled water setpoint, parameter Minimum CW Temp Value, (Service Menu, Setpoints), the control will operate ONLY the second cooling source control, i.e., the compressor is locked out. Above the minimum chilled water setpoint, assuming the fluid temperature is below the return room air temperature (delta T between room and glycol = true), the control will operate the second cooling source control and compressor control simultaneously if needed.

If the Minimum CW Temp is disabled, the second cooling source temperature is ignored, the control will always operate the second cooling source and compressors simultaneously when the load requires it.

GLYCOOL™ Cooling—Free-Cooling

When GLYCOOL cooling is available, the temperature control will calculate a total cooling requirement of 200% rather than 100%. Assuming that full GLYCOOL capacity is available, the GLYCOOL valve opens proportionally as the requirement for cooling rises from 0 to 100%. If more than 100% cooling is required, then the compressors are activated their normal activation settings within the 100-200% proportional band, 150% and 200%, respectively, on two-step systems (133%, 163%, 180% and 200% for a four-step system). If full GLYCOOL capacity is not available, then the GLYCOOL valve will be opened proportionally over a cooling requirement band equal to the available GLYCOOL capacity. The compressors would be activated when the GLYCOOL capacity is exceeded.

For example, if the GLYCOOL capacity is 60%, then the GLYCOOL valve would be fully open at 60% cooling requirement. The compressors would continue to activate or deactivate based on shifting the activation points from 0-100% to 100-200% in relation to the cooling output band within the 100-200% proportional band. To reduce compressor cycling and prevent hunting, GLYCOOL capacity first becomes available when the entering glycol temperature is at least 8°F (4.4°C) (22% capacity) below the return air temperature, or 3°F (1.7°C) below the return air temperature for two hours. GLYCOOL capacity is 100% when the glycol temperature is 25°F (13.9°C) below the return air temperature. The system will continue to operate in Econ-O-Cool mode as necessary as long as the entering glycol temperature remains at least 3°F (1.7°C) (0% capacity) below the return air temperature. If GLYCOOL is not available, the compressors' activation and deactivation points are not shifted as explained above.

Dual Cooling Source

If dual cooling is available, the system operates in the same manner as a GLYCOOL system, except that it is assumed that 100% chilled water capacity is available any time the chilled water temperature is 3°F (1.7°C) below the return air temperature.

3.4 Temperature Control—Reheat

If the room air temperature becomes too cold, the control will call for heating. Heating mode is controlled by the Temperature Proportional Band, explained in **3.2.1 - Temperature Proportional Band**.

3.4.1 Electric, Hot Gas and Hot Water Reheat

Different types of cooling units feature different types of standard electrical heating. Not all types offer hot gas or hot water reheat. The number of electrical heating stages also varies—some types of cooling units have single-stage electrical heating as standard and offer two-stage electrical heating as an option. Other types feature three-stage heating as standard.

The Reheat Proportional Band is divided into three equal parts, each representing one reheat stage. As the Temperature Proportional Band increases the call for heating from 0% to -100%, stages 1 through 3 are switched On, as shown in **Figure 21**. Your unit will have one of the nine reheat configuration types shown in **Table 4**.

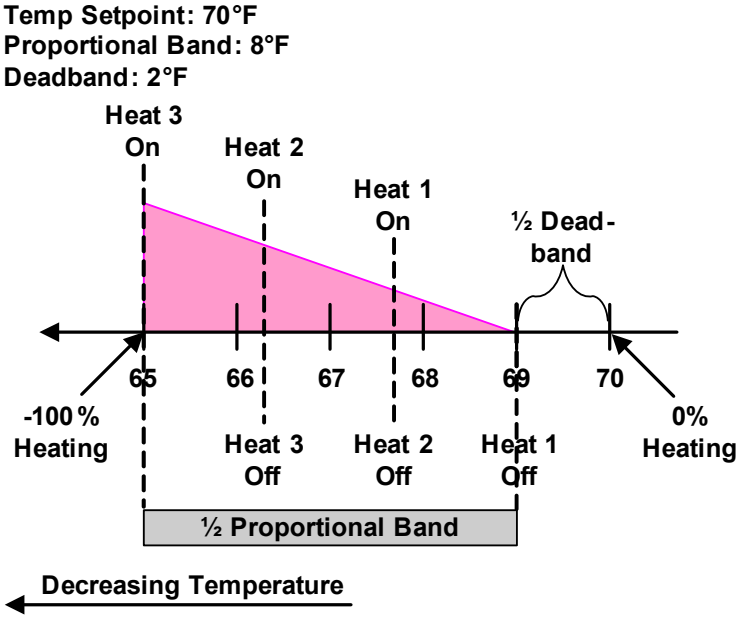
Table 4 Reheat configuration types

Type	A	B	C	D	E	F	G	H	I
Stage 1	Electric 1	Electric 1	Electric 1	Hot Gas	Hot Gas	Hot Gas	Hot Water	Hot Water	Hot Water
Stage 2	-	Electric 2	Electric 2	-	Electric 1	Electric 1	-	Electric 1	Electric 1
Stage 3	-	-	Electric 3	-	-	Electric 2	-	-	Electric 2

NOTE

1. *Hot gas / hot water are not influenced by the setting of electric reheat during dehumidification.*
2. *Hot gas output will be set only if the selected compressor is in operation.*

Figure 21 Three-stage heating



3.4.2 SCR Reheat

SCR reheat is a type of electric reheat that provides tighter temperature control than staged electric reheat. SCR reheat capacity modulation is achieved by pulsing the reheat On and Off. Full capacity is achieved by constantly energizing the reheat. Units equipped with SCR reheat can operate in Tight or Standard mode. By default, cooling units with SCR reheat are factory-set to operate in Tight mode. The mode of operation can be set by adjusting the SCR Control Type parameter (Service Menu, Setpoints).

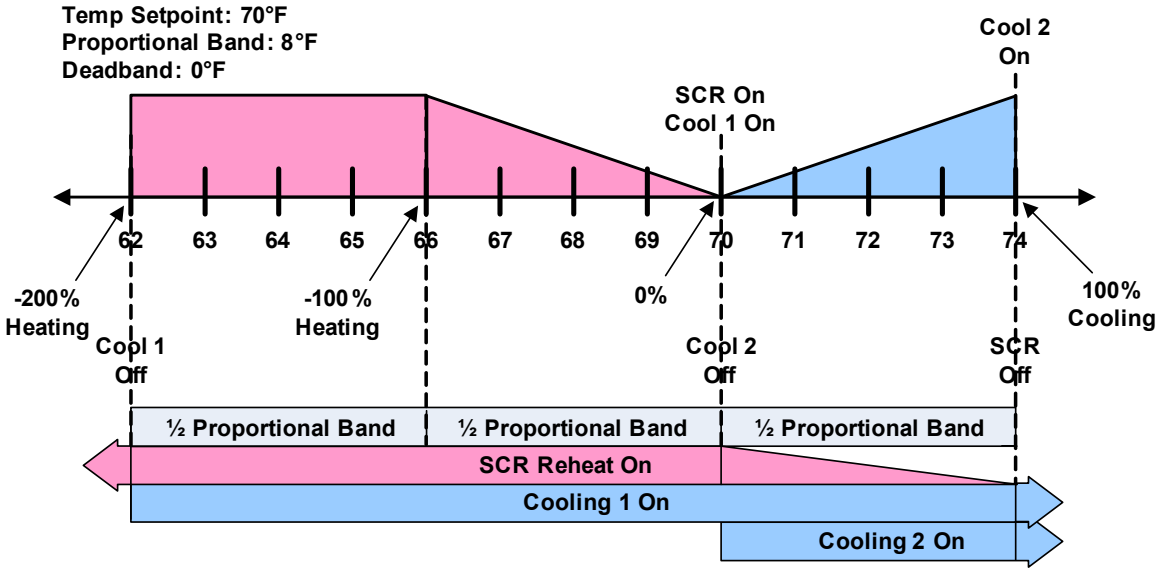
Tight Mode

In Tight mode, the compressors and reheats are operated at the same time to provide maximum temperature control. The temperature deadband is set to zero at the factory. In a cooling unit with SCR reheat and two single-step compressors, the first single-step compressor is started and full reheat capacity is provided at 0% calculated output from the Temperature Proportional Band. As the call for cooling increases from 0% to 100%, the reheat capacity is slowly reduced by pulsing the reheat. At 100% call for cooling, the reheat is deactivated and the second single-step compressor is started. As the call for cooling is reduced, the reheat capacity is slowly increased. When the call for cooling returns to 0%, the second single-step compressor is deactivated.

If the Temperature Proportional Band calculates a call for heating from 0% to -200%, the first single-step compressor remains activated and full reheat capacity is provided. Based on the factory default settings, the first single-step compressor is deactivated when the control reaches -200% call for heating. The compressor remains deactivated until the control calls for 0% heating. The compressor activation and deactivation points can be adjusted in the Service menu under Setpoints. **Figure 22** illustrates how a cooling unit with two single-step compressors and SCR reheat operates when the SCR Control Type is set to Tight mode.

NOTE
Some cooling units are not suited for a strict NO LOAD application. These cooling units require a minimal load in the space. Consult factory for verification.

Figure 22 Two single-step compressors with SCR reheat set to Tight mode

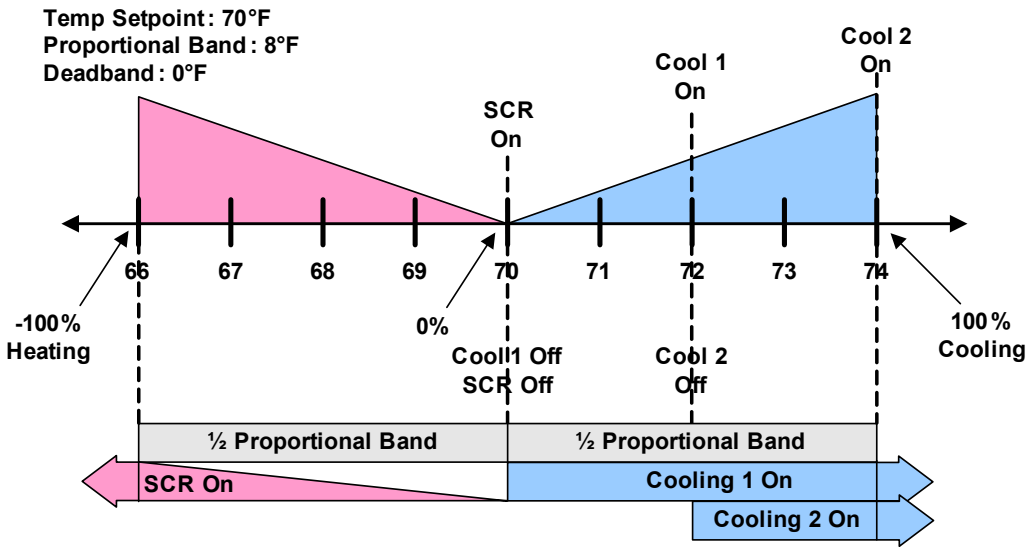


Standard Mode

In Standard mode, the SCR reheat operates only when the Temperature Proportional Band calls for heating. SCR reheat output is adjusted proportionally as the Temperature Proportional Band varies the requirement for heating from 0% to -100%. Compressors operate only when there is a call for cooling as described in **3.2.2 - Compressor Control**.

Figure 23 illustrates how SCR reheat operates when SCR Control Type is set to Standard mode.

Figure 23 Two single-step compressors with SCR reheat set to Standard mode



NOTE

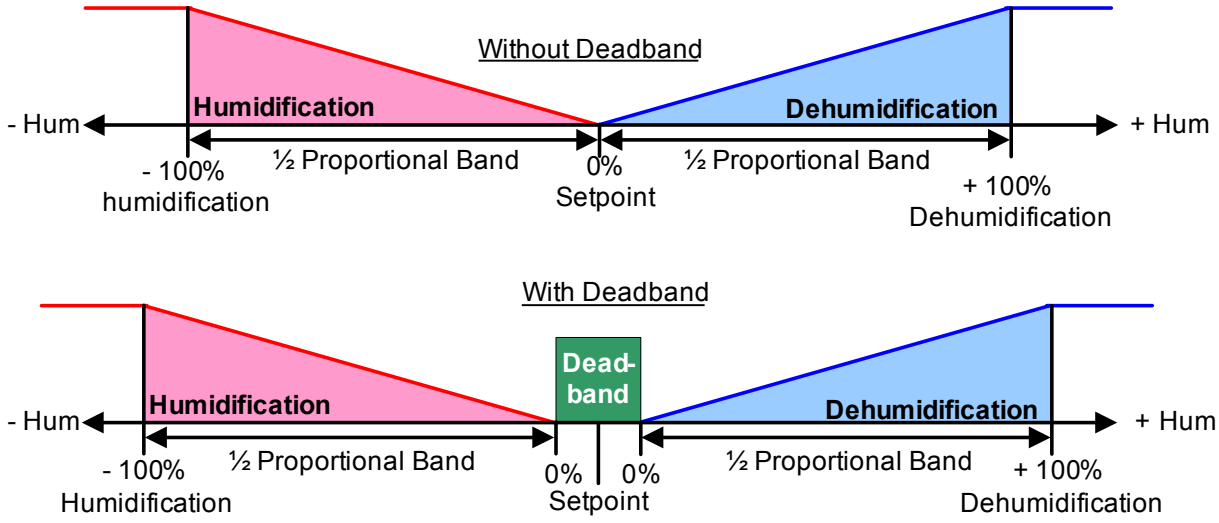
Using SCR in Standard mode in conjunction with variable cooling capacity (e.g., chilled water valve or digital compressor) provides ultimate capacity control and energy-efficiency gains.

3.5 Humidity Control

The control uses the humidity proportional band to determine which operation to perform (dehumidification/humidification) and how much capacity to provide. The Humidity Proportional Band is a user defined range that is divided into two equal parts for dehumidifying and humidifying. The Humidity Setpoint is located between these two equal parts.

An optional Humidity Deadband range can be defined, which is equally divided on either side of the setpoint and separates the two halves of the proportional band. **Figure 24** illustrates how the humidity proportional band is evenly divided on either side of the humidity setpoint, with and without a deadband.

Figure 24 Humidity proportional band



When the return air humidity deviates from the setpoint, either dehumidification or humidification is activated. If the return air humidity increases, the control calls for 0% (none) to 100% (full) dehumidifying capacity, based on how far the humidity penetrates the dehumidification portion of the proportional band. If the return air humidity decreases, the control calls for 0% (none) to -100% (full) humidifying capacity based on how far the humidity penetrates the humidification portion of the proportional band.

When the return air humidity reaches the end of the proportional band, either 100% or -100%, full dehumidification or full humidification capacity is provided. No operation is performed when a 0% call is calculated. The control varies the call for dehumidifying and humidifying in 1% increments as the return air humidity moves through the proportional band halves.

The deadband range is used to widen the setpoint. When the return air humidity falls within the deadband, the control operates the same as if the humidity equaled the setpoint exactly. This setting helps maximize component life by preventing excessive component cycling. The Humidity Proportional Band and Humidity Deadband parameters are in the Service menu under the Setpoints submenu. The Humidity Setpoint parameter is in both the User menu and Service menu under Setpoints.

3.5.1 Humidification

Infrared Humidifier

There are two types of infrared humidifiers: small pan (IFS) and large pan (IFL). The operating mode of each is similar, however, some of the variables or timings differ. The Liebert Challenger has different fill times because of the size of the pan.

Infrared humidifiers are started at 100% humidification request, and stopped at 0%. Infrared humidifiers cannot be driven in proportional mode.

Table 5 Parameters for infrared humidifier control

Parameter	IFS Default	IFL Default	Liebert Challenger
Humidity in Last xx Hours	15 hours	15 hours	15 hours
Fill Time	33 seconds	56 seconds	27 seconds
Humidifier On Time	440 seconds	576 seconds	568 seconds
Flush Rate	150%	150%	150%

An autoflush system automatically controls a water makeup valve to maintain proper levels in the infrared humidifier water pan during humidifier operation. If humidification is needed and 15 hours have elapsed since the last time the humidifier was on, then the humidifier is not turned on until the valve completes an initial fill of the humidifier pan. This pre-fill is about 30 seconds for a small pan and 60 seconds for a large pan. The valve continues to fill and flush the pan for about 4-1/2 minutes for a small pan or 7-1/2 minutes for a large pan. Pan size is selected based on unit specifications and is preset at the factory.

During humidifier operation, with the flush rate set at the default of 150%, the valve is opened periodically to add water to the pan (about 45 seconds every 7 minutes of humidifier operation for a small pan, or 80 seconds every 10 minutes of operation for a large pan). This adds enough water to the pan to cause about a third of the total water used to be flushed out of the overflow standpipe located in the humidifier pan. This action helps to remove solids from the pan. The flush rate is adjustable from 110% to 500% in 10% intervals. Default is 150%. If the water quality is poor, it may be desirable to increase the water flushing action above the normal 150% rate. Also, if the supply water pressure is low, the flush rate adjustment can be increased so that sufficient water level is maintained during humidification. The flush rate parameter, Infrared Flush Rate (Service Menu, Options Setup), is adjustable from 110%-500%.

External Humidifier Control—Optional

A factory-supplied option may be provided to allow a start-stop command to be sent to the control of a remote-mounted humidifier.

Steam Generating Canister Humidifier

The Steam Generating Humidifier has its own separate control board that manages the canister and steam rate. Liebert iCOM sends an On-Off command to relay a call for humidification.

3.5.2 Dehumidification

The Dehumidification Enable parameter (Service Menu, Options Setup) allows for enabling/disabling the dehumidification function.

A call for dehumidification is calculated in the same way as a cooling request. The components (valves, compressors) will follow this dehumidification request as soon as it is higher than the request for cooling.

Dehumidification Low Limit

Low Limit 1 and Low Limit 2 are used to avoid overcooling a room during dehumidification. When a low limit is reached, a compressor or the liquid cooling source that is used for dehumidification is disabled. It is re-enabled when the return air temperature rises. The Low Limit 1 and 2 settings are in the Service menu under Setpoints.

Low Limit 1: Low Limit 1 will disable one of two compressors for dehumidification. If only one compressor is set for dehumidification, or if the dehumidification source is chilled water, this limit will not be visible and will be inactive.

Low Limit 2: Low Limit 2 will disable both compressors for dehumidification. This limit will also stop dehumidification in single compressor units and in chilled water units.

The limits become active when the return air temperature drops below a temperature value equal to the sum of the temperature setpoint plus the value set on Low Limit 1 and 2 (the Low Limit settings are negative values).

A dehumidification source is deactivated if the return air temperature drops below the Deactivation Temperature, as in this example:

Temperature Setpoint:	70°F (21.1°C)
Low Limit Value:	-7°F (-3.8°C)
Deactivation Temperature:	63°F (17.2°C)

NOTE

*If a cooling unit is equipped with SCR reheat and the SCR Control Type parameter is set to Tight mode, then Low Limit 2 will be ignored, see **3.4 - Temperature Control—Reheat**.*

Dehumidification Compressor Quantity

Under Factory Settings in the Advanced menu there is an item called Dehumidification With Comp. This will be set to either 1, 2, 1 or 2, or BOTH. This setting determines which compressors are used for dehumidification. It also determines if Low Limit 1 will be available and impacts how the reheats will operate during dehumidification. The Dehumidification With Comp field is set when the cooling unit is built and should not be adjusted without first consulting the factory. **Table 6** outlines which Low Limit settings will be available, based on the Dehumidification With Comp selection.

Table 6 Dehumidification With Comp settings

Available to Set Value	Dehumidification With Comp Setting	Default Setting On
Low Limit 2 only	[blank] (units without compressors)	All Chilled Water Units
	1 or 2 (Compressor 1 and 2 alternate)	Liebert DS
Low Limit 1 & 2	Both (both compressors dehumidify)	—

Low Limit 1 & 2 will be available only on cooling units with two compressors when Dehumidification With Comp is set to BOTH (see **WARNING on page 30**).

Reheat During Dehumidification

Hot gas reheat or hot water reheat will start as described in **3.4 - Temperature Control—Reheat**, when the temperature decreases during the dehumidification process.

The parameter Electric Reheat Operation defines how the heaters react in case the temperature decreases during the dehumidification process. This parameter does not impact SCR reheat operation. The Electric Reheat Operation parameter is in the Advanced menu under Factory Settings and should not be adjusted without factory approval.

No—No electric reheat allowed during dehumidification process.

Delayed—This setting applies only to two-compressor units with BOTH compressors selected for dehumidification. The electric reheats are prevented from turning on until Low Limit 1 is reached. At this condition, one stage of dehumidification is disabled and the reheats are activated. At Low Limit 2, both stages of dehumidification are disabled. When Delayed is selected on units with a single compressor selected for dehumidification (Dehumidification With Comp Setting: 1, 2, and 1 or 2), the reheats will operate in the same manner as they do for Staged as described below. Delayed is the default setting for Liebert DS units.

Staged—This setting applies to one or two compressor units. Electric heaters will stage as described in **3.4.1 - Electric, Hot Gas and Hot Water Reheat**. Staged is the default setting for Challenger 3000 units. On two compressor units with staged reheat selected and Dehumidification With Comp set to BOTH, the control allows for operating two compressors and reheats simultaneously. It is important that electrical service to the unit be sized and wired for this option if selected.

WARNING

If the electrical service to the unit is not properly sized, it could trip the building circuit breakers (or fuses) or, in extreme cases, damage the building wiring. This Warning applies only when the Dehumidification With Comp is set to BOTH and the Electric Reheat Operation is set to Staged. Consult factory before making any changes to the default settings.

3.6 Control Types

3.6.1 Temperature and Humidity Control Types

The Liebert iCOM has three Temperature and Humidity Control Types:

- Proportional
- PI
- Intelligent

Each control type affects the timing and intensity of the cooling/heating and humidifying/dehumidifying operations. The Control Type parameter is in the Service menu under Setpoints.

Proportional—If Proportional Control is selected, the percent cooling/heating requirement is determined by the difference between the air temperature sensor reading and the temperature setpoint. As the air temperature rises above the temperature setpoint, the percent cooling required increases proportionally (from 0 to 100%) over half the programmable temperature proportional band (See **3.2.1 - Temperature Proportional Band**). The percent heating requirement (0 to -100%) is determined the same way when the air temperature falls below the setpoint. The humidifying/dehumidifying operations are controlled in the same manner as the cooling/heating operations; however, the humidity sensors, setpoints and proportional bands are utilized. The Proportional control type is commonly selected on compressorized units.

PI—If PI Control is selected, the percent cooling/heating requirement is calculated by adding together two individual terms, proportional and integral. The proportional term is calculated in a manner similar to the previously described Proportional control. The integral term (sometimes called “reset action”) is calculated by measuring how much and for how long the air temperature/humidity has been above or below the setpoint. If the actual air temperature/humidity is above the setpoint, the percent requirement is slowly but continuously increased until the total is sufficient to bring the return room air back to the setpoint. This control type is commonly selected on free-cooling and dual-cool units.

Intelligent—If Intelligent Control is selected, the air temperature/humidity is controlled at or near the setpoint. The percent temperature/humidity adjustment required is calculated based on logic that is programmed into the control. This logic simulates the actions that a human operator would take if manually controlling the system. This control type is commonly selected on chilled water units.

NOTE

*The actual air temperature sensor reading is always displayed on the Status menu. The value displayed for the return air humidity sensor reading depends on the Humidity Sensor Control Type (see **3.6.2 - Humidity Sensor Reading Control Types**).*

3.6.2 Humidity Sensor Reading Control Types

The Liebert iCOM has three humidity sensor control types: Relative, Compensated and Predictive. The humidity sensor control adjusts how the Temperature and Humidity Control determines the percent requirement for humidification/dehumidification. The humidity sensor control type parameter, Humidity Control Type, is in both the User and Service menus under Setpoints.

Relative—The actual return air humidity sensor reading is sent to the Temperature and Humidity Control to determine if and how much humidification/dehumidification is required. The actual return air humidity reading is displayed on the Status menu. Unnecessary dehumidification can result when overcooling occurs during a dehumidification cycle. This is because a higher than normal relative humidity (RH) reading is caused by overcooling the room. This extends the dehumidification cycle. Later, when the dehumidification ends and the return air temperature rises to the setpoint, the RH reading falls. The final RH reading will then be lower than actually desired. If significant overcooling occurred, the RH could be low enough to activate the humidifier.

Compensated—The actual return air humidity sensor reading is sent to the Temperature and Humidity Control where the Humidity Setpoint is adjusted based on how much the return room air temperature deviates from the desired temperature setpoint. The adjusted humidity setpoint is used for humidification percent requirement determination. For every 1°C deviation from the temperature setpoint the humidity setpoint is changed by 3% RH, inversely proportional: if the temperature increases, the humidity setpoint is decreased, and vice versa. The recalculated humidity setpoint is shown as the Actual Humidity Setpoint (User Menu, Sensor Data). As the humidity setpoint is automatically adjusted, the high and low humidity setpoints (User Menu, Set Alarms) are adjusted accordingly. The unadjusted humidity sensor reading is displayed on the Status menu.

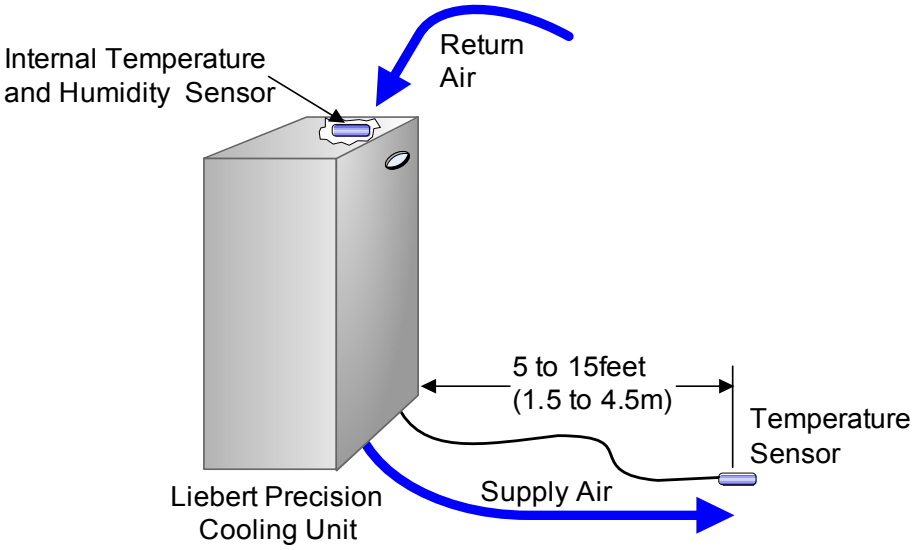
Predictive—The actual return air humidity sensor reading is adjusted before it is sent to the Temperature and Humidity Control. The humidity sensor reading is adjusted based on how much the return room air temperature deviates from the desired temperature setpoint. For every 1°C deviation from the temperature setpoint, the humidity sensor reading is changed by 3% RH, directly proportional: if the temperature increases, the humidity reading is increased and vice versa. The adjusted humidity sensor reading is displayed on the Status menu. Units are shipped from the factory with Predictive humidity control set as default.

If Compensated or Predictive humidity sensor control is selected, overdehumidification is avoided. When overcooling occurs, causing an increase in the relative humidity sensor reading, the humidity control program predicts what the RH will be when the dehumidification cycle ends and return air temperature returns to the setpoint. This allows the dehumidification cycle to end at the proper time. The Compensated and Predictive humidity sensor control can reduce energy consumption by minimizing compressor and reheat operation, and eliminating unnecessary humidifier operation.

NOTE

The historical humidity sensor graphs will display the real (unadjusted) sensor readings, no matter which Humidity Control Sensor Type is selected. The graphical sensor data is in the User menu under Graphics.

Figure 25 Placing temperature and temperature/humidity sensors



3.7 Supply Control

3.7.1 Supply Air

The Supply Air sensor can be used to control, limit or reference the discharge air temperature of the cooling unit. The desired supply sensor operation can be selected in the Service, Setpoints menu. The optional supply air temperature sensor allows use of either the Supply Air control or the Supply Limit control. This sensor can be added to existing Liebert iCOMs by purchasing the supply sensor and wiring harness. The supply air sensor must be connected to P13 pins 1 & 2. Contact your local Emerson representative for pricing and installation.

- **Supply Control**: When the supply sensor is set to Control, the unit will control the amount of cooling / heating being provided based on maintaining the discharge air temperature. The return air sensor will still control the humidity of the room.

NOTE
*If unit is equipped with a 3P actuator type valve then the valve must be changed to utilize the feedback signal. See **3.2.3 - Chilled Water Control**.*

- **Supply Limit:** Chilled water units may be set up with the supply air sensor to maintain a minimum air temperature under a raised floor to help prevent condensation. In order to avoid supply temperatures that are too low, the Supply Limit can influence the opening of three-point or analog actuators or the output of analog valves. The control compares the deviation from the return air setpoint and the supply limit setpoint, and calculates the output to the actuator from the smaller deviation.
- **Cooling Only:** When Cooling Only is selected, the cooling capacity of the system (valve or compressor) is modulated based on the supply temperature, but allows the fan speed to be controlled by a different sensor.
- **Disable**: Setting the supply sensor to Disable will allow the supply sensor to be monitored but will not affect the control output of the unit.

NOTE
Supply control and limit are calculated on each unit, independent of the other sensor readings on the network.

When the supply air sensor is set up for Supply control, additional Supply Air configuration parameters (valve pulse, cooling filters and return compensation) can be used to further enhance the supply air control.

- The valve pulse and cooling filter timer can be adjusted to prevent oscillating around the supply setpoint and still allow for rapid valve adjustments to compensate for heat load changes. Contact your local Liebert service personnel for adjustments.
- Return Compensation begins to increase the supply air setpoint when the return air decreases below the return air setpoint.

  Example

  Setting the return compensation value in the Service, Setpoints menu to 5°F (2.7°C) will increase the supply setpoint from 50°F to 55°F (10°C to12.8°C) when the return temperature is at the low limit of the proportional band.

3.8 Liebert Smart Aisle Control

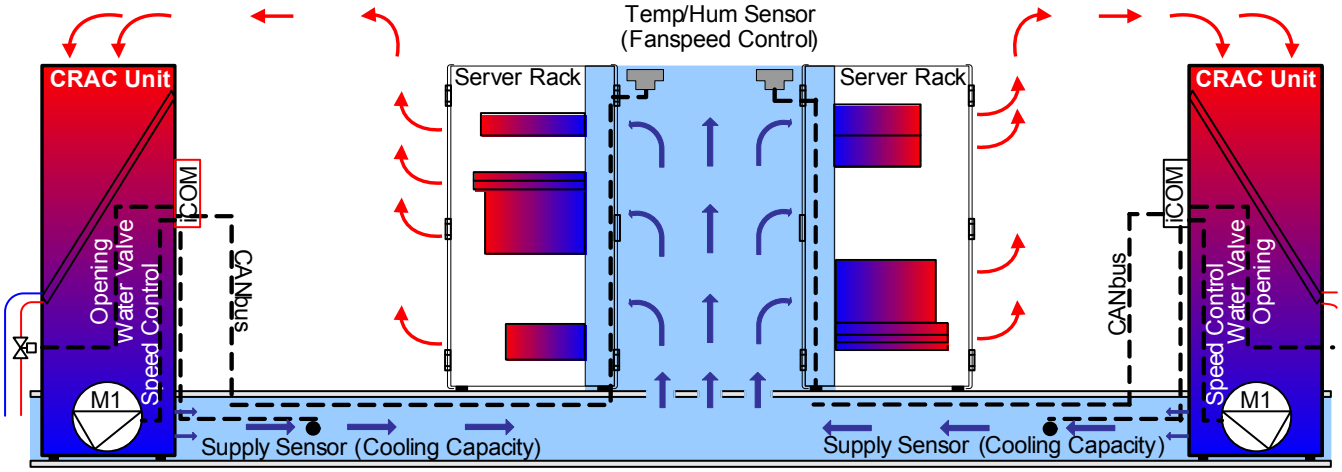
Liebert Smart Aisle Control allows the Liebert iCOM to manage airflow and cooling capacity independently. This control mode allows the unit to adjust the airflow based on the cold aisle temperature and the cooling output based on the discharge air temperature.

The Liebert Smart Aisle Control focuses on the inlet temperature to the racks. The Liebert Smart Aisle Control also manages each component independently to manage the energy usage to provide the correct amount of cooling. As the environment changes, the Liebert iCOM will adjust the airflow and heat rejection based on the sensor readings at the discharge air temperature of the unit and the cold aisle temperature.

The Liebert Smart Aisle Control also will automatically adjust cooling based on the configuration of the cold aisle. The control can automatically adjust fan speed and cooling capacity when the cold aisle configuration is changed. This includes no containment, end containment and total containment of the cold aisle.

Currently, the Liebert Smart Aisle Control is limited to chilled water units with variable speed fans and one cold aisle sensor per unit.

Figure 26 Equipment layout for Liebert Smart Aisle Control



3.8.1 Hardware Setup

The Liebert Smart Aisle Control requires:

- A temperature/humidity sensor in the cold aisle and connected to the Liebert iCOM via CAN bus. This can be done by:
  - Moving the return temperature sensor from the cooling unit to the cold aisle with a longer CAN Bus cable
    OR BY
  - Obtaining a remote temperature sensor and addressing it to operate as the return temperature sensor.
- An additional supply temperature sensor placed under the raised floor.

3.8.2 Software Setup

To prepare the Liebert iCOM for Liebert Smart Aisle Control:

1. Set Service Menu parameter S146 (VSD fan speed) to Auto. This sets the cold aisle sensor to control the fan speed.

   The cold aisle temperature setpoint can be set on parameter S102 (Temperature Setpoint).
2. Set Service Menu parameter S124 (supply sensor) to Cooling Only. This sets the supply sensor to control the chilled water valve.

   The discharge temperature setpoint can be set on parameter Service Menu S125 (Supply Setpoint).

3.9 Event Types and Properties

Liebert iCOM events are used to inform the user of cooling unit operational status. All events are recorded in the Event Log, which is in the User Menu. The user can change the type (alarm, warn, message) and time delay of some events and can also enable or disable some events. These event settings are in the Service Menu under Set Alarms, pages 3 to 7. If an event has a safety function (high pressure, low pressure, main fan overload, etc.) the safety function will be executed in any case, independent of the selected event type or if enabled or disabled. The timing will function as set.

NOTE
Not all critical event properties can be adjusted.

Event Types

- **Message**: If this event occurs, it will only be entered into the event log.
- **Warning**: If this event occurs, a warning will be generated and entered into the event log. The general alarm relay will be activated only if parameter Warning Activates Alarm Relay located in the Service menu under Alarm Setup is set to Yes (Yes is the default setting from the factory)
- **Alarm**: If this event occurs, an alarm will be generated and entered into the event log. An alarm does not necessarily switch off the whole cooling unit; it depends on which alarm occurs. If a standby unit is set, any alarm will stop the faulty unit and ask the standby unit to start. Standby activation is achieved on alarms ONLY; messages or warnings will not start the standby unit. For more on standby units, see **4.0 - Teamwork**.

Time Delay

Delays the event reaction once it is triggered. The time delay applies to safety functions and is entered in seconds.

Enable or Disable

Disabled events do not show up in the event log, on the display or on monitoring devices. Also, the common alarm relay will not be activated if a disabled alarm occurs. Safety functions, such as lockout compressor in case of high pressure are still performed.

NOTE
Once an event, either Warn or Alarm type, has been set to Disable, the associated alarm condition will not be annunciated. Disabled events may be reset only through the menu item Reset Disabled Alarms.

NOTE
The value of the external delay includes the internal delay if it is greater than the internal delay.

*The minimum setting of the external delay is the value of the internal delay. This is valid only for values marked with *.*

Table 7 Possible event settings—some events not available in all units

Event	Internal Delay (Before Action Occurs)	Default Delay / Selectable (Before Action Occurs)	Type (default)
MAIN FAN OVERLOAD	2 seconds	5 seconds / 0 – 9999 *	ALM
LOSS OF AIRFLOW	3 seconds	3 seconds / 0 – 9999 *	ALM
CLOGGED FILTERS	2 seconds	2 seconds / 0 – 9999 *	WRN
HIGH ROOM TEMP	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW ROOM TEMP	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
HIGH ROOM HUM	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW ROOM HUM	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
HIGH TEMP SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW TEMP SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
HIGH HUM SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW HUM SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
COMP 1 OVERLOAD	Internal Calc.	no	ALM
COMP 2 OVERLOAD	Internal Calc.	no	ALM
COMP 1 HIGH PRESSURE	Internal Calc.	no	ALM
COMP 2 HIGH PRESSURE	Internal Calc.	no	ALM
COMP 1 LOW PRESSURE	Internal Calc.	no	ALM
COMP 2 LOW PRESSURE	Internal Calc.	no	ALM
COMP 1 PUMPDOWN FAIL	Internal Calc.	no	ALM
COMP 2 PUMPDOWN FAIL	Internal Calc.	no	ALM
DIG SCROLL1 HIGH TEMP	Internal Calc.	no	ALM
DIG SCROLL2 HIGH TEMP	Internal Calc.	no	ALM
EL HEAT HIGH TEMP	5 Sec	0 sec / 0 – 9999	WRN
WORKING HRS EXCEEDED	0 Sec	0 sec / 0 – 9999	Fixed to WRN
SMOKE DETECTED	2 Sec	2 sec / 0 – 9999 *	ALM
WATER UNDER FLOOR	2 Sec	2 sec / 0 – 9999 *	ALM
COND PUMP-HIGH WATER	2 Sec	2 sec / 0 – 9999 *	ALM
LOSS OF FLOW	5 Sec Reset Delay: 10 Sec	2 sec / 0 – 9999 *	ALM
STBY GLYCOL PUMP ON	2 Sec	2 sec / 0 – 9999 *	ALM
STANDBY UNIT ON	2 Sec	2 sec / 0 – 9999 *	ALM
HUMIDIFIER PROBLEM	2 Sec	2 sec / 0 – 9999 *	ALM
NO CONNECTION w/Unit1	Internal Calc.	-	WRN
UNIT X DISCONNECTED	Internal Calc.	-	WRN
LOSS OF POWER	0 Sec	No	ALM
CUSTOMER INPUT 1	2 Sec	2 sec / 0 – 9999 *	ALM
CUSTOMER INPUT 2	2 Sec	2 sec / 0 – 9999 *	ALM
CUSTOMER INPUT 3	2 Sec	2 sec / 0 – 9999 *	ALM
CUSTOMER INPUT 4	2 Sec	2 sec / 0 – 9999 *	ALM
CALL SERVICE	2 Sec	2 sec / 0 – 9999 *	MSG
HIGH TEMPERATURE	2 Sec	2 sec / 0 – 9999 *	MSG
LOSS OF AIR BLOWER 1	2 Sec	2 sec / 0 – 9999 *	ALM
REHEAT LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
HUMIDIFIER LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
FC LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
COMPRESSOR(S) LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
COMP 1 SHORT CYCLE	0 Sec	0 - 9999	MSG
COMP 2 SHORT CYCLE	0 Sec	0 - 9999	MSG

3.9.1 High- and Low-Temperature and Humidity Events

High- and low-temperature and humidity alarms can be set for both the internal and optional external sensors. If a sensor reading exceeds a preset threshold, a warning will appear. These warnings are ignored after unit startup for a minimum of 1 minute. To increase the delay to warn, see **3.9 - Event Types and Properties**. The threshold settings are located in both the User and Service menus under Set Alarms.

To apply threshold limits on the internal cooling unit sensors, the Return Sensor Alarms must be enabled. The high and low temperature and humidity internal sensor thresholds can then be set. To apply threshold limits on the optional external sensors, the Sensor A alarms must be enabled. The high and low temperature and humidity external sensor thresholds can then be set. If no external sensors are connected to the unit, it is recommended that the Sensor A Alarms be disabled.

NOTE

The event messages will automatically reset if the temperature/humidity stays 1.8°F (1°C)/ 2% RH below or above the threshold for one minute.

3.9.2 User Inputs

The user can connect and specify up to four inputs depending on unit configuration. The user inputs are digital inputs that can provide information about an event associated with the unit or space. The customer input configuration settings are in the Service menu under Set Alarms, Screen 2 of 7. The choices for the customer inputs are shown in **Table 8** along with their associated reaction. A terminal strip is provided in the cooling unit to connect your contact closure to. You have the ability to set the control to react on an open or closed contact.

NOTE

To enabled/disabled, delay activation and set event type (alarm, warn, message) see ***Event Types on page 34****.*

Table 8 Customer inputs

Setting	Reaction
Smoke	Event Only
Water Alarm	Event Only
C PMP Alarm	Event Only
Flow Alarm	Event Only
Stdby G Pmp	Event Only
Stdby Unit	Event Only
C-Input 1	Event Only
C-Input 2	Event Only
C-Input 3	Event Only
C-Input 4	Event Only
Rht Lockout	Event + Electrical Heaters Disabled
Hum Lockout	Event + Humidifier Disabled
Rht+Hum Lock	Event + Electrical Heaters and Humidifier Disabled
Comp Lockout	Event + Compressor(s) Disabled w/o Pump Down
Call Service	Event Only
High Temp	Event Only
Air Loss	Event Only
FC Lockout	Event + Free Cooling Disabled
Heater Alarm	Event + Heaters Off (Liebert PeX Only)
Flow AL SD	Event + Shut Down the Unit
Flow AL LC	Event + Lockout Compressors, No Pump Down (enabled only if at least one compressor is on; auto-reset depends on input status)
Comp Lock PD	Event + Compressor(s) Disabled w/ Pump Down
Enable FC	Forces Free Cooling to On
HTRJ VFD	Activates the HEAT REJ VFD ALARM; no other function
HTRJ TVSS	Activates the HEAT REJ TVSS ALARM; no other function

3.9.3 Analog Inputs—Liebert CW and Liebert DS Air-Cooled Units

The Liebert iCOM allows an external sensor or analog device to be connected, scaled and viewed on the Liebert iCOM large display for Liebert CW and Liebert DS air-cooled units only. These external devices require optional analog input connections that can be installed on new units at the factory or added to existing units in the field. The option provides the electrical connection from the Liebert iCOM control board to the cooling unit's field-wiring connection area. If a Liebert CW or Liebert DS air-cooled unit is equipped with this option, then a 0-10VDC, 0-5VDC or a 4-20mA device can be connected to terminals 41 and 42, 43 and 44, 45 and 46 or 47 and 48. See **Table 9** for analog input availability.

Table 9 Number of analog inputs

Unit Type	Number of Analog Inputs
Liebert CW with MBV	4
Liebert CW with 3P (Stem Valve)	3; one used for valve feedback
Liebert DS Air-Cooled (DX)	2; two used for suction pressure management

NOTE

This option is not available on fluid-cooled units. Fluid-cooled units use all four analog inputs for low and high refrigerant pressure management.

Follow the settings illustrated in **Figure 27** and **Table 10** to set the input type based on the sensor output being used. The default analog input is 0-5VDC. Only properly trained and qualified service technicians should change the analog input type.

Figure 27 Analog connection control board switch

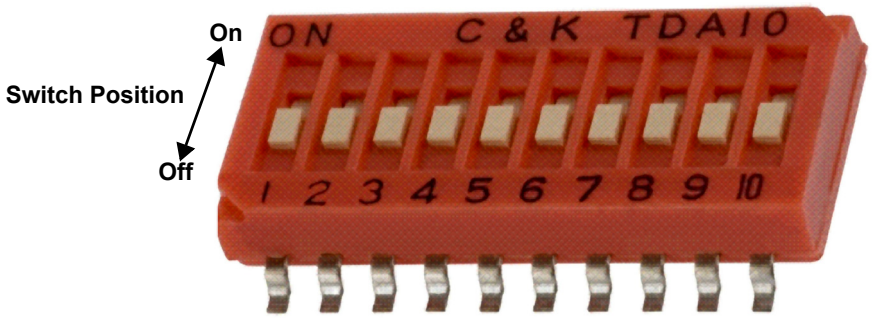


Table 10 Analog connection control board switch position

Analog Input #		Input #1		Input #2		Input #3		Input #4	
Control Board Switch Number		1	2	3	4	5	6	7	8
Analog Input Device Value	0 to 10VDC	Off	Off	Off	Off	Off	Off	Off	Off
	0 to 5VDC	On	Off	On	Off	On	Off	On	Off
	4 to 20mA	On	On	On	On	On	On	On	On

Switches #9 and #10 not applicable to Liebert CW or to Liebert DS.

3.9.4 Liebert iCOM-DO

The Liebert iCOM-DO is an optional discrete output relay card that can be connected to the Liebert iCOMs for providing dry alarm contact outputs for monitoring systems. The Liebert iCOM-DO is a direct replacement of the Liebert ENV-DO card that was supported on previous Liebert control systems. The Liebert iCOM-DO allows simultaneous use of the Liebert Intellislot cards as the Liebert iCOM-DO communicates over the CANbus network instead of the IGMnet interface.

Liebert iCOM-DO card provides up to 15 configurable alarms through relay outputs. For the ratings and additional data, refer to the Liebert iCOM-DO manual, SL-28096. Each alarm output has 3 terminals: N/C, N/O and common. The Liebert iCOM-DO setup can be found in the Service, Liebert iCOM-DO menu (large display only). The Liebert iCOM-DO is pre-configured and its present is automatically detected by the Liebert iCOM once it is connected to the CANbus line. The default alarm configuration matches the original Liebert ENV-DO card alarm mapping.

Table 11 Alarm mapping

#	Alarm	Notes
01	Cooling Status	The output is active when cooling is on.
02	Heating Status	The output is active when heating is on.
03	Humidifying Status	The output is active when humidification is on.
04	Dehumidifying Status	The output is active when dehumidification is on.
05	High Temperature	The output is active when high temperature alarm is active.
06	High Humidity	The output is active when the high humidity alarm is active.
07	Low Temperature	The output is active when the low temperature alarm is active.
08	Low Humidity	The output is active when the low humidity alarm is active.
09a	High Head Pressure C1	The output is active when the compressor 1 high head pressure alarm is active.
09b	High Head Pressure C2	The output is active when the compressor 2 high head pressure alarm is active.
10	Loss of Airflow	The output is active when a loss of air flow alarm is active.
11	Change Filters	The output is active when a change filter alarm is active.
12	Water Alarm	The output is active when a water alarm is active.
13	Condensing Pump Alarm	The output is active when the condensing pump alarm is active.
14	Glycool Status	The output is active when is free-cooling active.
15	Unit On	The output is active the unit is turned on.

An event is active as long as it is not acknowledged. Once acknowledged, an alarm remains active until the event situation is not true anymore and the event is reset by the board, which switches off the red LED and the general alarm relay.

3.9.5 Possible Event Notifications

Table 12 lists examples of alarms and warnings that can be configured for a cooling unit. When any of these occur, they will appear on the Liebert iCOM Status menu and will be recorded in the Liebert iCOM Event log.

Table 12 Event notifications—large or small display

Event	Type
COMP 1 HRS EXCEEDED	WRN
COMP 2 HRS EXCEEDED	WRN
EL HEAT1 HRS EXCEEDED	WRN
EL HEAT2 HRS EXCEEDED	WRN
EL HEAT3 HRS EXCEEDED	WRN
FC HRS EXCEEDED	WRN
GENERAL ALARM	ALM
GLYCOL TEMP SENSOR	WRN
HIGH CW TEMP	WRN
HUM HRS EXCEEDED	WRN
HUMIDIFIER PROBLEM	—
HW/HG HRS EXCEEDED	WRN
LOSS OF CW FLOW	ALM
NETWORK FAILURE	WRN
ON-OFF KEY DISABLED	WRN
POWER ON	MSG
POWER OFF	MSG
ROOM SENSOR FAILURE	ALM
UNIT DISABLED	MSG
UNIT HRS EXCEEDED	WRN
UNIT ON	MSG
UNIT OFF	MSG
UNIT DISABLED	MSG
UNIT SHUTDOWN	MSG
UNIT SYNCHRONIZATION	MSG
SENSOR A FAILURE	WRN
SLEEP MODE	MSG
STANDBY MODE	MSG
SUPPLY SENSOR FAILURE	WRN

3.10 Wellness—Next Maintenance Calculation

The next maintenance calculation, as well as the diagnostics feature, will help keep the cooling unit running at peak performance to ensure minimum component stress and maximum reliability. The diagnostics will help the service engineer evaluate the unit's operation since the last maintenance.

3.10.1 Calculating Next Maintenance and Diagnostics

If the unit includes any of the following components, they are included in the calculation:

- Fan(s)
- Compressor 1
- Compressor 2
- Electric Heaters
- Humidifier

For each component, the next maintenance will be calculated from the following parameters:

- Standard service interval (1, 2 or 4 times a year) (to be set)
- Working hours (counted)
- Number of starts (counted)
- Average running time (calculated)
- Optimum number of starts per hour (to be set)
- Maximum number of starts per hour (to be set)
- Maximum bonus to enlarge time to next maintenance (to be set)
- Maximum penalty to reduce time to next maintenance (to be set)

Calculating Unit Wellness

Liebert iCOM keeps tabs on the condition of a cooling unit, determining its wellness and projecting when service will be needed, for the entire unit as well as for individual components. This assists in scheduling maintenance calls and helps pinpoint components likely to require service.

Liebert iCOM displays a graphic for needed maintenance. It begins with the standard maintenance interval—12 months, six months or three months—and adjusts that based on its calculation of components' wellness.

To calculate wellness, Liebert iCOM keeps a running total of component working hours and the number of times it has been started. Liebert iCOM relates that data to the optimum/maximum starts per hour. Accordingly, Liebert iCOM will increase or decrease the time before the next service call.

The more frequently a component starts, the sooner it is likely to need maintenance. If, for example, a unit's fan runs continuously, but it's compressor starts and stops often, Liebert iCOM records that and calls for maintenance based on the compressor's wellness factor.

Alarms and warnings, such as clogged filters or high or low pressure, reduce the time till the next maintenance to zero. If the alarm is cleared and reset, Liebert iCOM recalculates wellness. It begins with the pre-alarm maintenance time and factors in the alarm.

Parameters for Next Maintenance Calculation

General Maintenance Settings

- **Maintenance Frequency**—can be set as one to 12 months or to zero, which disables maintenance calculation
- **Max. Bonus**—increases the time to next maintenance with the set value, if all components run optimally (number of starts, average running time)
- **Max. Penalty value**—decreases the time to next maintenance with the set value, if some components run in non-optimum way (number of starts, average running time)
- **Last Maintenance**—date can be set from service-engineer; informational
- **Service-Engineer**—name of the service engineer; editable
- **Reset**—puts all counters of all components, such as (motor, compressors, heaters and humidifier), at zero and starts a new maintenance calculation (reset to be done after maintenance)

Fans / Heaters / Humidifier Settings and Diagnostics

- Number of starts and Working hours are counted separately since the last maintenance. Total working hours can be read in the standard working hours window (customer window).
- Average Working Hours is the calculation, resulting from starts and working hours.
- Starts per Day Optimum is the number of starts considered as optimum.
- Starts per Day Worst is the number of starts considered as hunting (worst case).
- Number of Alarms counts the alarms, happened between two service intervals.
- Actual Bonus is calculated from number of starts and average working time. Can be positive (bonus) or negative (penalty). This value influences the time remaining to the next maintenance.

Compressor 1 / 2 Settings and Diagnostics

- Number of starts and Working hours are individually counted since the last maintenance. Total working hours can be read in the standard working hours window (customer window).
- Average Working Hours is the calculation, resulting from starts and working hours.
- Starts per Day Optimum is the number of starts considered as optimum.
- Starts per Day Worst is the number of starts considered as hunting (worst case).
- Number of HP Alarms counts the high-pressure alarms, happened between 2 service intervals.
- Number of LP Alarms counts the low-pressure alarms, happened between 2 service intervals.
- Number of TH Alarms counts the thermal protection alarms, happened between 2 service intervals.
- Actual Bonus is calculated from number of starts and average working time. Can be positive (bonus) or negative (penalty). This value influences the time remaining to the next maintenance.

4.0 TEAMWORK

Unit-2-Unit (U2U) communications via a private network will allow the following functions to be placed into operation when the requirement exists. The user must install the correct hardware (see **5.0 - Installing a Liebert iCOM Unit-to-Unit Network**) and properly program the units for the selected functionality.

The Liebert iCOM network can perform the following functions:

The **Teamwork Mode** functions allow for multiple stages of cooling/heating and humidification/dehumidification. Teamwork Mode can be used to prevent environmental units from "fighting," where one environmental unit might be cooling while another unit is heating.

The **Standby (Lead/Lag)** function allows one or more units to be set as "Running" and "Standby" for activation in case of an alarm. This function also allows the units to be programmed in a rotation to help ensure "Standby" unit operation.

The **Cascade Operation** function allows additional units to be staged-on based on the temperature or humidity requirement.

4.1 Teamwork Modes

Groups of cooling units connected to a network can be set up to work together in any of three teamwork modes:

- No Teamwork
- Teamwork Mode 1
- Teamwork Mode 2

All Liebert iCOM-controlled cooling units on a network must be set to run in the same teamwork mode.

4.1.1 Application of Teamwork Modes

- **No Teamwork**: Multiple zones in one room
- **Teamwork Mode 1**: Balanced load (small groups of units inside the same environment)
- **Teamwork Mode 2**: Unbalanced load (large rooms, not all units will have the same load) (work well for most applications)

All units in a network will run in the same Teamwork Mode.

4.1.2 No Teamwork

All cooling units work independently, responding to their own sensors.

Standby function and unit rotation are possible, but cascading is not (see **Standby and Cascade on page 44**). Autoset will not adjust the proportional band in this mode.

4.1.3 Teamwork Mode 1

Teamwork Mode 1 works best in small rooms with balanced heat loads. The return temperature and humidity sensor readings of all units in operation (fan on) are averaged by the master unit, Unit #1, and used for control. The master unit will send the operating requirements to all operating units according to unit numbers, rotated by one unit every 24 hours.

In this teamwork mode, most of the parameters are shared; if set in any one of the units, all other units will follow with the same settings. AutoSet will adjust the proportional band in Teamwork Mode 1, see **3.2.1 - Temperature Proportional Band**.

The master unit evenly divides the system proportional band among the number of available units. Each unit will receive instruction on how to operate from the master unit based on how far the system deviates from the setpoints.

The number of available units is calculated like:

- In non-standby configuration: all units with fan on
- In typical standby function (no cascade): all units with fan on
- In cascade mode: all units that could operate (no alarm, which forces the unit to switch off, unit not switched off, etc.)

NOTE

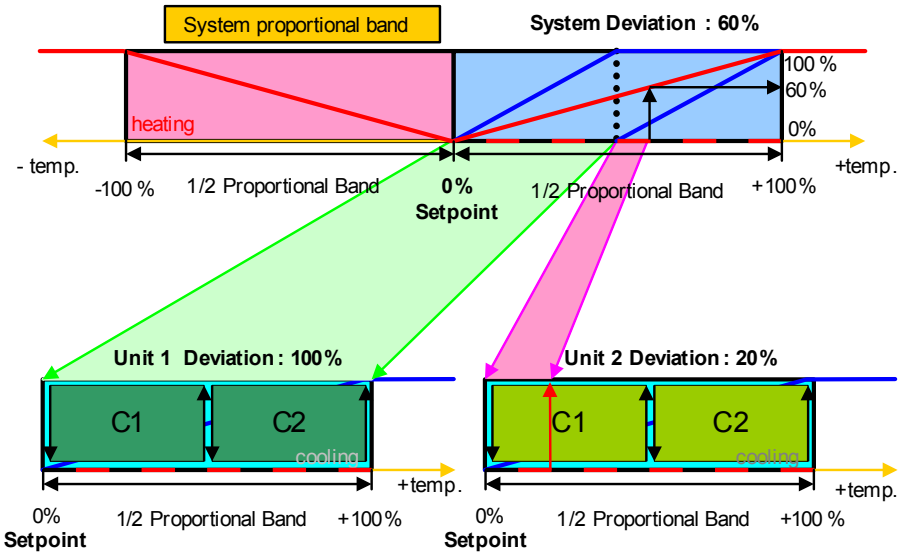
1. *Proportional actuators (chilled water valve, free-cooling actuator) are driven in parallel in all units.*
2. *Changeover to second cooling source, low limit during dehumidification and low supply limit control air local functions, managed from each unit independently.*

Figure 28 shows how two cooling units work together in Teamwork Mode 1. Since Unit 1 and Unit 2 are available to operate, the master unit, Unit 1, averages the temperature and humidity sensor readings from each unit.

The master unit determines that a 60% call for cooling is required for the system. Since there are two available cooling units, each unit makes up half of the system proportional band; Unit 1 handles 0-50% system call for cooling and Unit 2 handles 51-100%. For every 1% system call for cooling, each unit provides 2% of its total cooling capacity.

The 60% system call for cooling exceeds the 50% Unit 1 can provide, so Unit 1 operates at full capacity. The remaining 10% system call for cooling (60% - 50% = 10%) is handled by Unit 2. Unit 2 responds by operating at 20% cooling capacity (50% ÷ 10% = 20%).

Figure 28 Teamwork Mode 1 with two cooling units



4.1.4 Teamwork Mode 2

Teamwork Mode 2 is designed to prevent units within a group from working against each other or "fighting." It is best applied in large rooms with unbalanced heat loads. In Teamwork Mode 2, all parameters are shared equal to Mode 1, and Unit #1 averages all of the available unit sensor readings on the network to define whether there is a cooling, heating, dehumidification or humidification request.

If there is a cooling request, all units are released to start cooling resources according to their own temperature readings; heating is disabled for all units and vice versa. Same for humidity control.

If the network average would ask for 0% proportional band, the most demanding request (highest or lowest temperature of all units, highest or lowest humidity of all units) would be used to define the operation to be performed.

Teamwork Mode 2 does not rotate; unevenly distributed working hours to be expected. Autoset will not adjust the proportional band in this mode.

NOTE
In Teamwork Mode 2, all units must have the same setpoints. The units' proportional band, deadband and related settings may differ.

4.1.5 Standby—Rotation

Typical Standby (Lead/Lag) Function

This function can be performed in any teamwork mode, including NO Teamwork.

One or more units can be defined to be Standby; the normal status of standby units is Standby Off (fan off).

In case one regular unit has an alarm that is defined (to be defined in the alarm configuration), to switch on a standby unit, the faulty unit will switch off and the standby unit will switch on.

If the next unit has an alarm, the next standby unit will be started. If no more standby units are available, the unit with a non-critical alarm that permits unit operation will be switched on again (water detection, fan alarm, fire alarm etc. will not permit unit restarting).

The standby function can be rotated daily (setting the time), weekly (setting the day of the week and time) or monthly (setting the first weekday of the month and time).

The rotation is performed with a selectable number of units: if 1 is selected, to standby rotates from 1-2 to 2-3 in a 4 units configuration with two standby units, and rotates from 1-2 to 3-4 in the same configuration, when the rotation parameter is set to 2.

NOTE
Before entering standby mode, units will operate the fan only for 3 minutes to cool the electrical heaters, remove steam from the unit, etc.

Standby and Cascade

Cascade is possible in Teamwork Mode 1 only.

Standby units will start if an alarm occurs in one of the operational units. If the standby units are cascaded, they will also start and work with the regular operational units if the temperature or humidity cannot be controlled by the operational units; before a high or low temperature / humidity condition occurs. Cascaded units are switched off again as soon as the temperature / humidity returns back to normal.

The master unit defines its proportional band according to the number of available units (see **4.1.3 - Teamwork Mode 1**).

When a standby unit receives a request for full heating or cooling from the master unit (see **3.2.1 - Temperature Proportional Band**), it will respond to the request after its control delay.

NOTE
Cascaded units are not included in the calculation of the average temperature / humidity.

5.0 INSTALLING A LIEBERT iCOM UNIT-TO-UNIT NETWORK

Connecting multiple Liebert iCOM-controlled cooling units in an Ethernet Unit-to-Unit (U2U) network enables the units to work together to achieve efficient cooling and humidity control of the conditioned space. Networking enables setting up the cooling units to exchange data for various modes of operation:

- Teamwork
- Lead/Lag-Standby
- Rotation
- Cascade

However the cooling units are set up, a large display may be used to control and view the operational status of individual units or of the entire system.

NOTE
The maximum number of cooling units that may be interconnected is 32.

5.1 Placement of Cooling Units

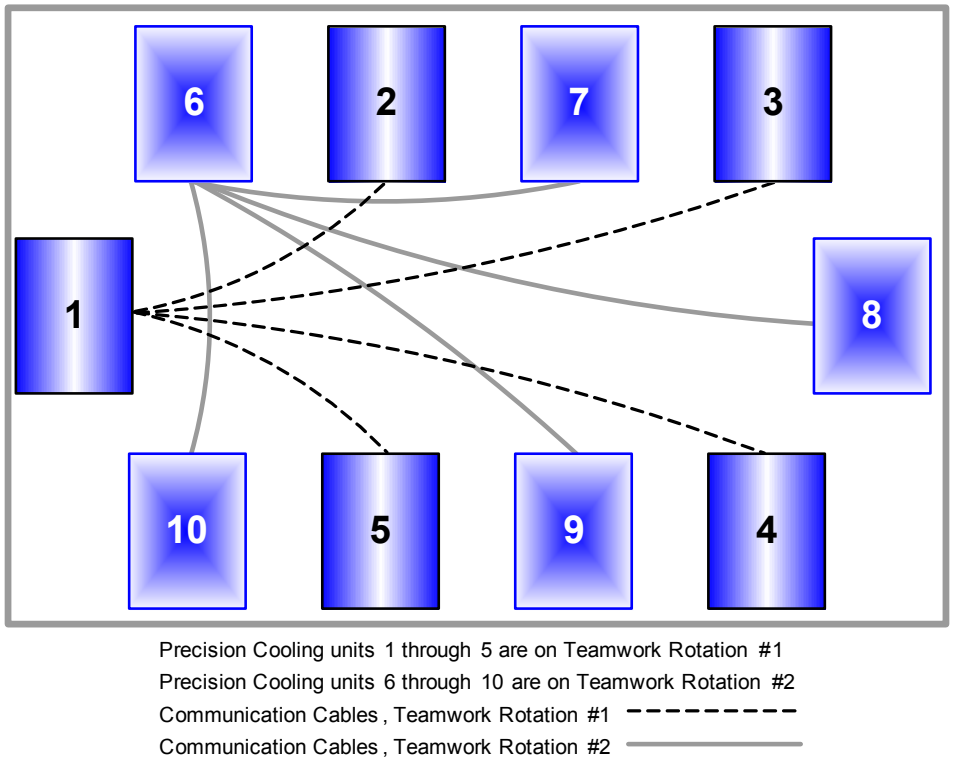
Refer to the cooling unit product manuals for details on installation. Also consider these factors when planning for installation of cooling units with Liebert iCOM controls:

- heat load in the conditioned space
- cooling air distribution
- number of operating units versus number of standby cooling units
- location of the network switch—An Ethernet cable cannot exceed 328 feet (100m)

5.1.1 Balancing Operating and Standby Units

Assign identification to the units in a manner that balances the operating units and standby units according to room layout and heat-load requirements. For example, identify the operating units with numbers 1 through 5 and the standby units 6 through 10. Refer to **Figure 29**.

Figure 29 Standby unit layout example—10 Precision Cooling units in room



5.2 U2U Hardware: Cables and Network Switch

Plan wiring runs for U2U communication when designing the layout of your conditioned space. In addition to general good wiring practices, take into account:

- Ethernet CAT5 or greater cable is required for interconnecting the units.
- Maximum distance must not exceed 328 feet (100m).
- A device to boost the Ethernet signal may be used to exceed the 328 feet (100m) length limitation.
- Ethernet network should be private—set up only for management and control of the cooling units.
- Keep control and communication cables away from power cables to prevent electromagnetic interference.
- Do not bend cables to less than four times the diameter of the cable.
- Do not deform cables when securing in bundles or when hanging them.
- Keep cables away from devices that can introduce noise into them, such as machines, fluorescent lights, and electronics.
- Avoid stretching Ethernet cables—tension when pulling cables should not exceed 25 pounds (11kg).
- Do not secure Ethernet cables with any method that might damage them; use approved hangers, such as telephone wire/RG-6 coaxial wire hangers, available at most hardware stores.

Minimum Network Switch Requirements

- IEEE 802.3; IEEE 802.3u
- 10/100 Mbps speed
- Multiple 10/100 RJ-45 ports—one shared; RJ-45 Uplink port

The Liebert vNSA™ is an approved powered network switch designed to support Liebert iCOM U2U networks. See **Liebert vNSA on page 53** for details.

5.3 Wiring for Unit-to-Unit Communications—U2U

Cooling units come from the factory-wired for stand-alone operation.

Liebert iCOM U2U Ethernet Network

The Liebert iCOM U2U network must be isolated from other network traffic. The network switch(es) that connect Liebert iCOMs need to be dedicated to supporting only Liebert iCOM communication. The U2U network cannot be connected to the building or IT network. If network communication is ever lost (failed network switch, etc.), all Liebert iCOM-controlled cooling units will continue to operate as independent units.

The Liebert iCOM can support up to 64 nodes on one network. An input/output board, large display, and large wall-mount display are each considered one node. Of the 64 nodes that may be connected, no more than 32 may be input/output boards (32 cooling units). A small display is not considered a node. Small displays connect directly to input/output boards that do not have large displays attached to them. The following table illustrates how a network can be configured.

Table 13 Sample Liebert iCOM network configurations

Sample Configuration	Input/Output Boards	Large Displays	Small Displays	Wall Mount Large Displays	Private Switch Required
1	2	0	2	0	No
2	2	0	2	1	Yes
3	3	0	3	0	Yes
4	2	1	1	0	Yes
5	8	4	4	1	Yes
6	32	32	0	0	Yes
7	32	27	5	5	Yes
8	32	0	32	32	Yes

Network communication can be configured during system startup by a Liebert-trained technician. For technical issues contact:

Liebert Technical Service
1050 Dearborn Drive
Columbus, Ohio 43235
Telephone: 1-800-LIEBSRV (1-800-543-2778)
E-Mail: **technicalservice@emersonnetworkpower.com**

5.3.1 Wiring a Liebert iCOM U2U Network

Small Displays

Two cooling units, each with a small display: To network two cooling units, each with a small display, connect a crossover CAT5 cable between the P64 connectors on each cooling unit's Liebert iCOM input/output board. A network switch is not needed (see **Figure 30**).

Figure 30 Connecting two cooling units, each with a small display, using a crossover Ethernet cable

Three or more units with small displays: To network three or more cooling units, each equipped with a small display. **Figure 33** shows that one plug of the CAT5 cable is connected to P64A connector and the other to the network switch. The P64A, which is connected to port P64 on the control board, is located near it on each cooling unit's Liebert iCOM input/output board to a common network switch. The P64A connector is a crossover coupler that on DS, CW and Challenger units.

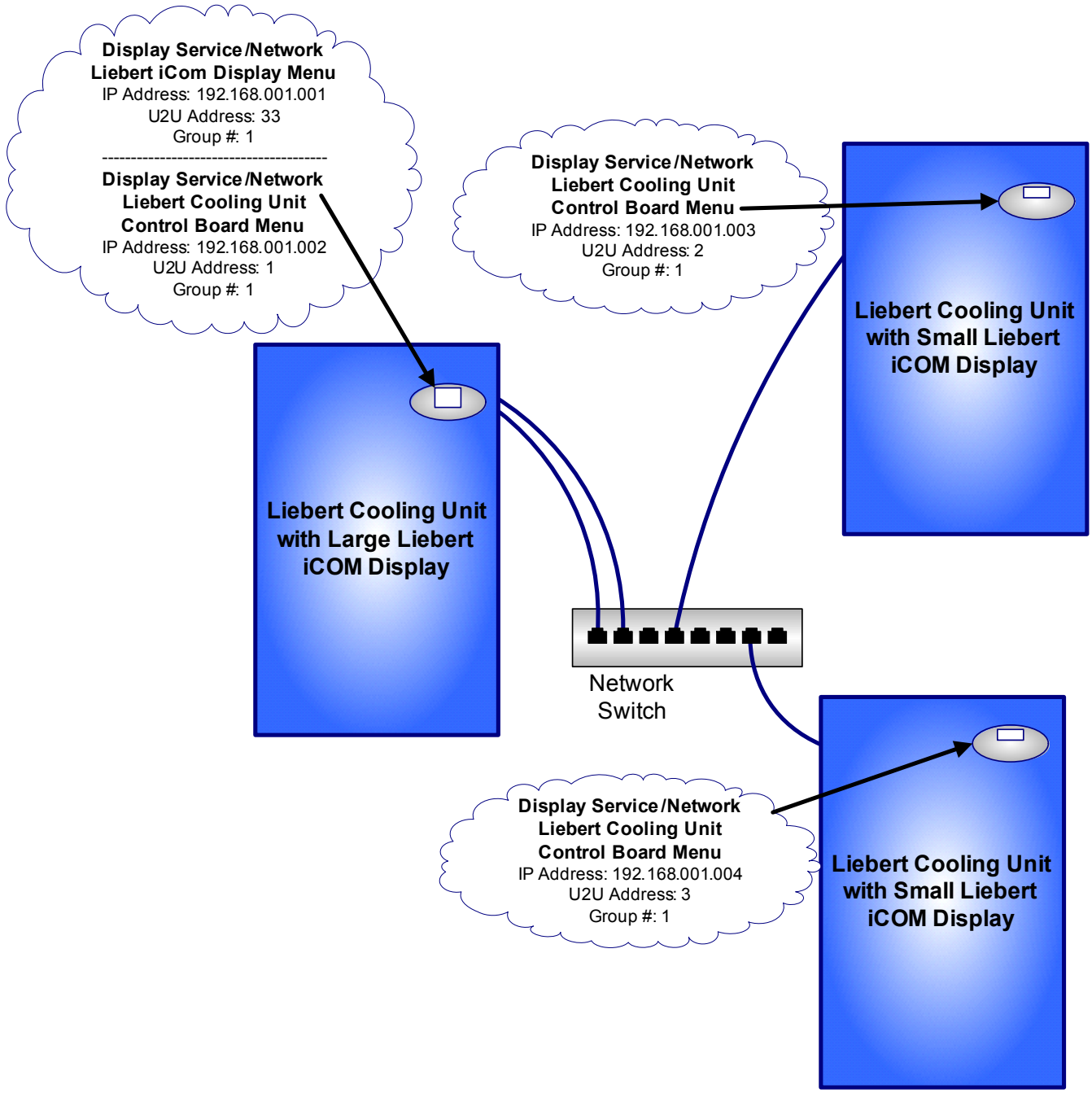
NOTE
If P64A is not available on a unit, connect directly to the Liebert iCOM board on P64.

Large Displays

A network switch is required to enable Ethernet communication on one or more cooling units with large displays. Each cooling unit with a large display requires two straight-through Ethernet cables from a network switch. One cable connects to port P64 on the Liebert iCOM input/output board and the other straight-through cable connects to the female-female coupler, if the female-to-female coupler is provided with the unit. Connect the red crossover cable, which is provided with the cooling unit, between the coupler and the P64 port on the back of the large display (see **Figure 34**). If the female-to-female coupler is not provided, connect the straight-through cable to Port P64 on the large display.

NOTE
A female-to-female coupler is factory-supplied on some cooling units equipped with a large display.

Figure 31 U2U network setup diagram



Wall-Mount Large Display

Only large displays can be used for remotely monitoring and controlling cooling units connected on the same network. Each wall-mount large display requires 120VAC or 230VAC input power; Liebert provides an AC adapter wall plug. A straight-through Ethernet cable must be connected between the network switch and the P64 port on the back of the display. This will enable control and monitoring capabilities to any cooling unit connected to the network.

Combining Large and Small Displays on a U2U Network

Setting up a network of cooling units equipped with large and small displays requires a network switch. The controls are to be connected to the switch as described above.

Figure 32 Wiring a small display for stand-alone operation

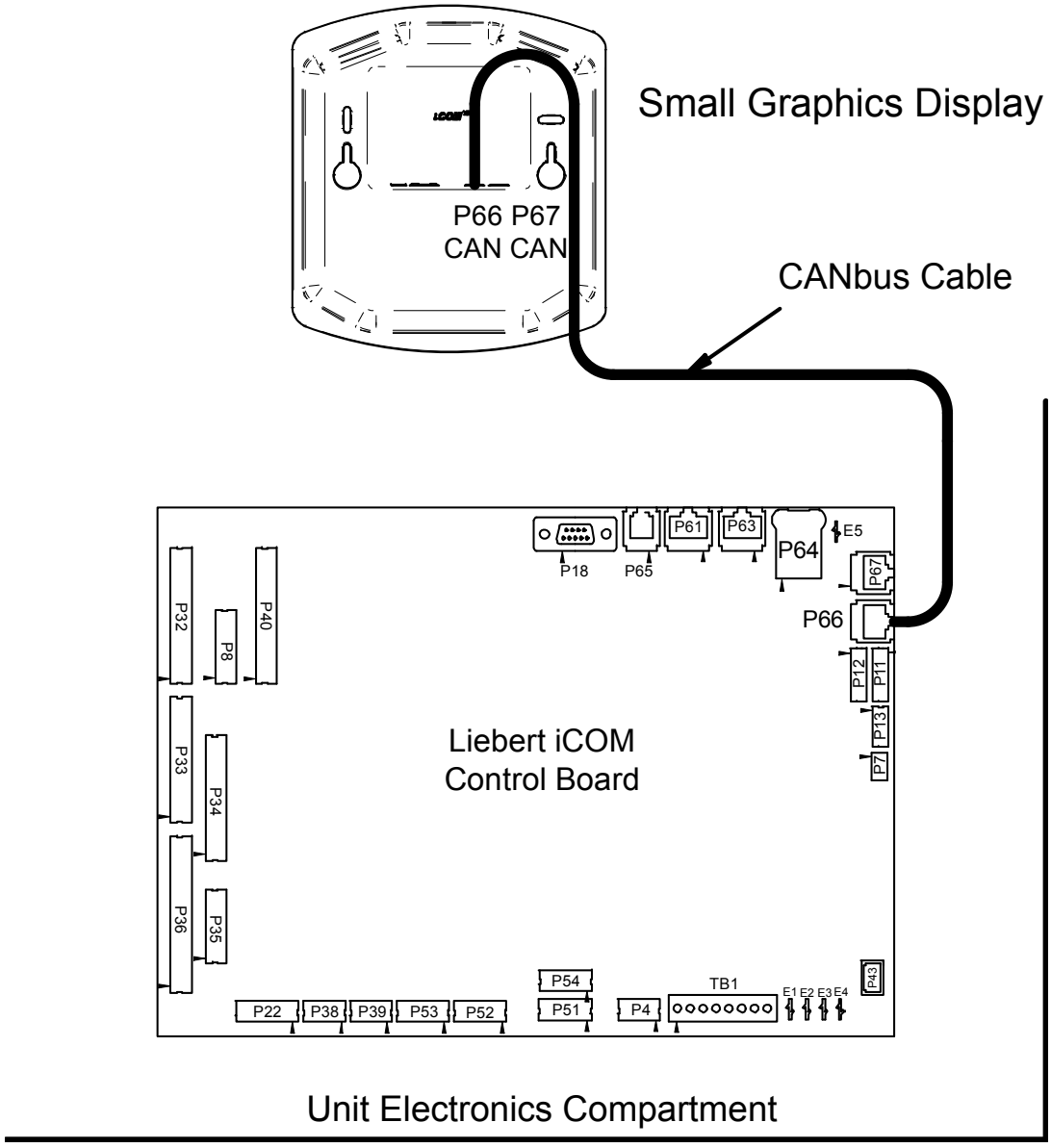


Figure 33 Wiring a small display for U2U network operation

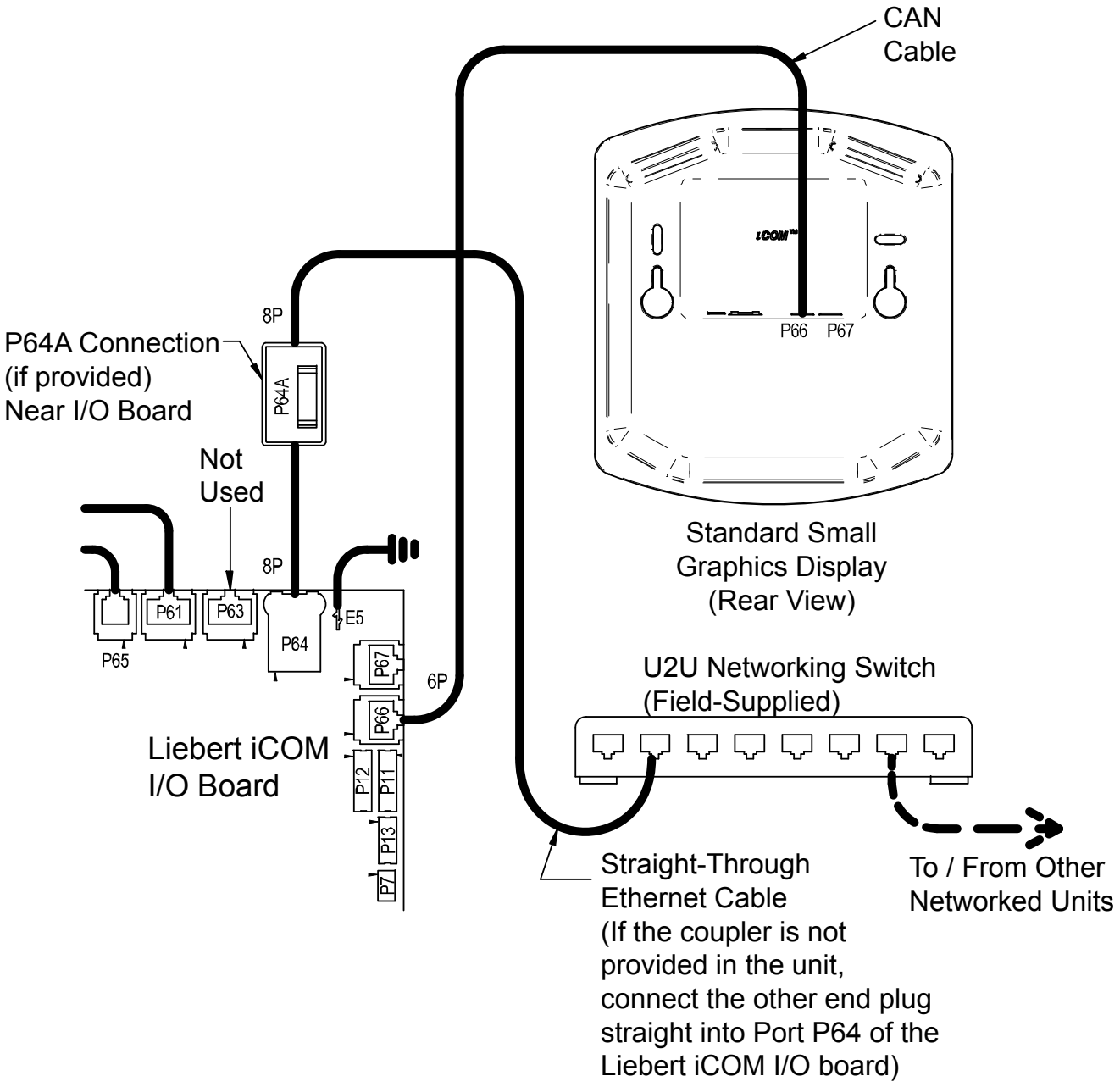
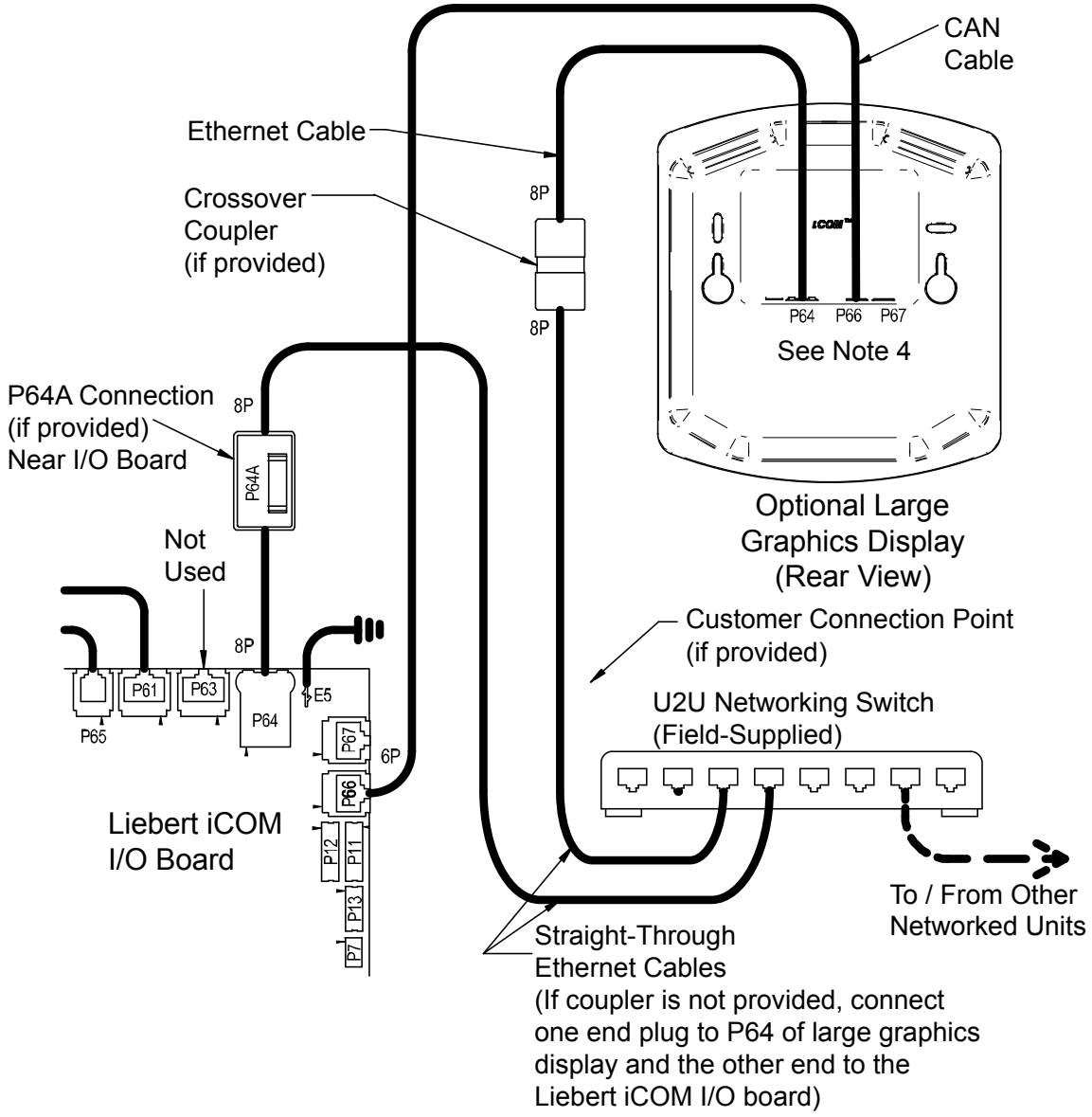


Figure 34 Wiring a large display for U2U network operation



Liebert vNSA

The Liebert vNSA is designed to connect multiple Liebert iCOMs. The Liebert vNSA contains either one or two powered industrial rail switches. An optional remote large display can be attached to the front door as well. All models have a power supply that requires connection to a single phase 120VAC or 230VAC power source. The enclosure features a key lock for security.

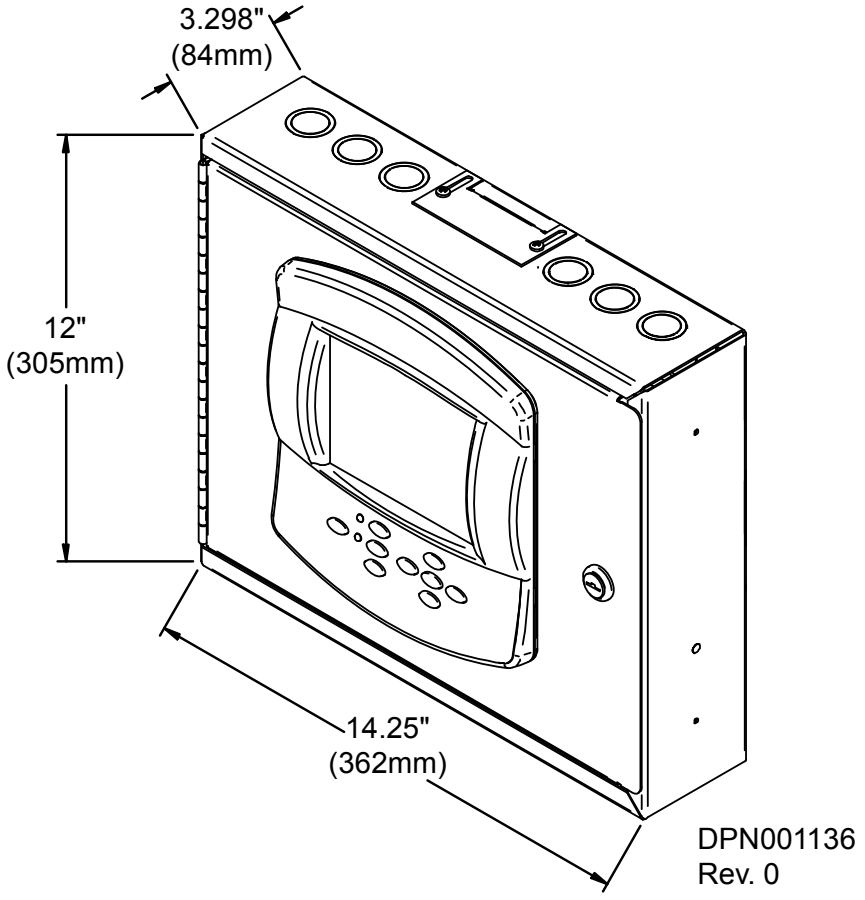
The Liebert vNSA supports autonegotiation, autopolarity and autocrossing, allowing for the use of standard network cables for connection to each port, rather than special crossover cables. The switch detects and makes adjustments for the network's speed and transmission mode, polarity and transmit-and-receive pins. See the Liebert vNSA user manual, SL-18840, for more details.

The number of ports available for connecting Liebert iCOMs varies by model as shown in **Table 14**. Models with a remote large display attached to the front door utilize one of the available Ethernet ports in the Liebert vNSA. Models with two switches utilize two ports to connect the switches.

Table 14 Ports available for connecting Liebert iCOMs

Model	Liebert vNSA With Remote Large Display	Total Number of Ports	Number of Ports Used to Connect Remote Large Display	Number of Ports Used to Interconnect Switches	Number of Ports Available to Connect Liebert iCOM Control Devices
Liebert vNSA8-Liebert iCOM	Yes	8	1	-	7
Liebert vNSA16-Liebert iCOM		16	1	2	13
Liebert vNSA8	No	8	-	-	8
Liebert vNSA16		16	-	2	14

Figure 35 Liebert vNSA with optional remote large display



6.0 External Communication—Building Management Systems, Liebert SiteScan®

Liebert iCOM is capable of communicating with external monitoring systems, such as Building Management Systems (BMS), Network Monitoring Systems (NMS), Liebert's SiteScan® Web system and others.

Each Liebert iCOM-controlled cooling unit is equipped with Liebert IntelliSlot plug-in slots for use with optional communication cards:

- Ethernet Web/SNMP Card
- RS-485 Modbus Card

The hot-swappable plug-in cards provide interfaces supporting open protocols, including Modbus, HTTP (Web) and SNMP. See the Liebert Web site for the latest supported protocols, Modbus reference information and SNMP MIBs: **www.liebert.com**

An alternate, limited method of communicating with an existing Liebert SiteScan Web monitoring system is via twisted-pair cables connected to terminals 77 and 78 on the cooling unit terminal strip. To use this method, the Liebert IntelliSlot power supply connection to P65 on the Liebert iCOM I/O board must be unplugged, and the factory-supplied 77-78 cable must be connected to P65 (follow Liebert SiteScan instructions for further connections). The appropriate Liebert iCOM control parameters must be configured to utilize the terminals.

Liebert iCOM software versions PA1.04.022.STD and older, which shipped before to November 2010, will support Velocity V3.

The older Velocity V3 cards will become obsolete with the advent of the Velocity V4 protocol and the newer Liebert IntelliSlot cards that communicate with this protocol. The newer cards are compatible with the older Liebert IntelliSlot cards' Modbus mapping and data.

NOTE
Liebert SiteScan will be limited to legacy parameters when communicating via Terminals 77 and 78.

Table 15 Liebert IntelliSlot card compatibility

Software Version	Card Compatibility	Protocol Supported
PA1.04.033.STD—Velocity V4	IS-485L	Modbus RTU 485
	IS-WEBL	SMTP, SNMP, SMS, HTTP
	IS-485EXI	Liebert SiteLink-E communication card (supports enhanced data set for Liebert iCOM)
	IS-IPBML	Modbus IP
	—	* BacNet available soon
PA1.04.022.STD and Older—Velocity V3	OC485-LBDS	Modbus RTU 485 / IGMNet Extended
	ISWEB-LBDS	SNMP , HTTP

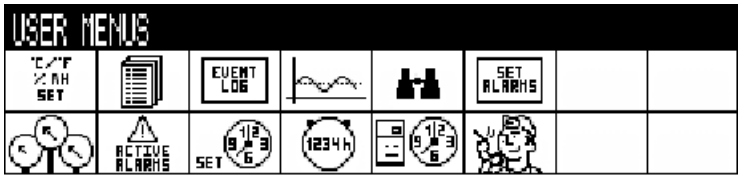
The newer communication cards support the latest information available through Liebert iCOM. Previous Liebert IntelliSlot cards should be used for legacy information.

7.0 User Menu Parameters

User menus report general cooling unit operations and status. The user menu password is **1490**.

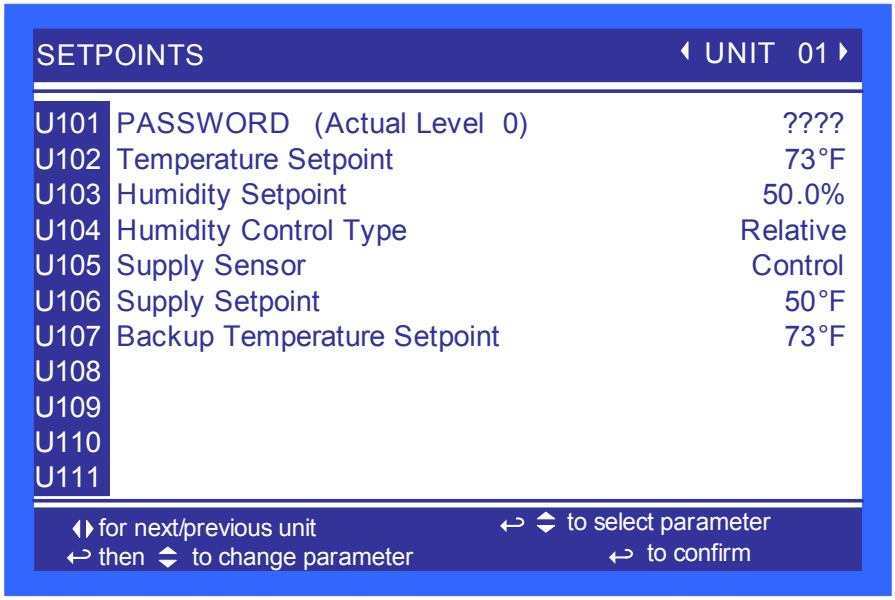
The User menu parameter tables in this manual may differ from the display on your cooling unit. The Liebert iCOM functions with several Liebert Precision Cooling units, each with its own set of control commands. In addition, the Liebert iCOM firmware is being updated constantly. As a result, the User menu parameter tables in this manual may differ from the display on your cooling unit. Check **www.liebert.com** for the latest Liebert iCOM user manual updates.

Figure 36 User menu icons



User Menu password: 1490

Figure 37 Setpoints screen



Temperature Setpoint—Selects a temperature that the cooling unit will maintain by applying cooling and or reheats.

Humidity Setpoint—Selects a humidity that the cooling unit will maintain by removing or adding moisture to the air.

Humidity Control Type—Selects the humidity control calculation. Setting this parameter to **"**Relative" will control the humidity without considering any temperature deviations. "Predictive" and "Absolute" control consider the temperature deviation from temperature setpoint so that a constant level of moisture is kept in the area based on the humidity sensor reading and the temperature deviation from setpoint.

Supply Sensor—Enables or disables the supply air temperature sensor. This sensor is an optional sensor that can be ordered from the factory (see **3.7 - Supply Control**).

Supply Setpoint Temp Value—Selects the discharge air setpoint (see **3.7 - Supply Control**).

Backup Temperature Setpoint—Selects a temperature setpoint that will be activated in the event of a BMS time-out or a customer input signal. The BMS timer and/or the customer input must be configured for this parameter to activate.

Spare Part List

Spare Parts—The spare parts lists contains a detailed description and part number that can be used to order parts for the unit. These part numbers are specific to each model and option installed on the unit.

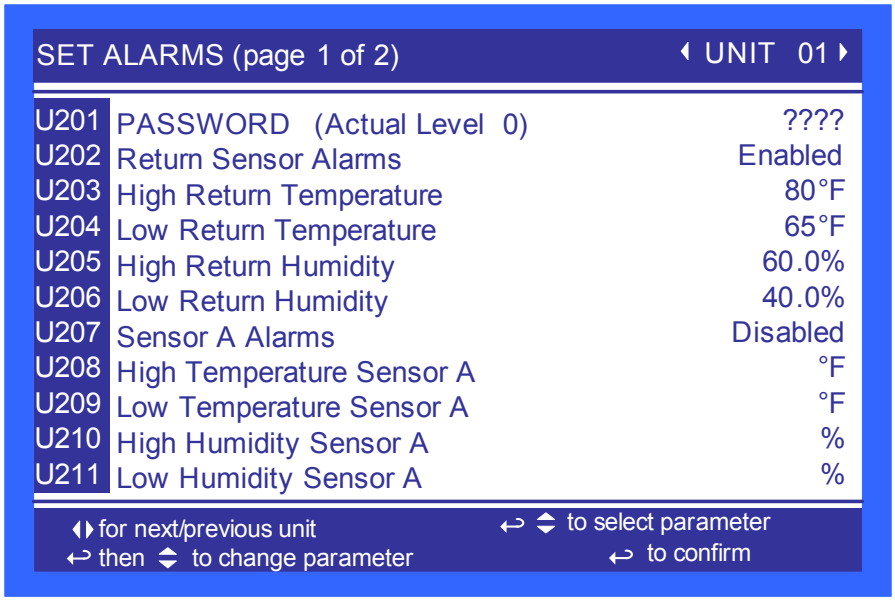
Event Log

Event Log—The event log displays all events and actions that have been generated by the unit. When multiple units are networked you will see the event log of the whole system. Each event shows the unit that generated the alarm, time and date stamp, a description and the event type

View Network

View Network—The view network screen provides an overview of the Liebert iCOM network and a status of each unit. This screen will provide the unique unit name given to the unit. If no name is given, then only the unit number will be displayed.

Figure 38 Set alarms screen, page 1


SET ALARMS (page 1 of 2)
UNIT 01
U201 PASSWORD (Actual Level 0) ????
U202 Return Sensor Alarms Enabled
U203 High Return Temperature 80°F
U204 Low Return Temperature 65°F
U205 High Return Humidity 60.0%
U206 Low Return Humidity 40.0%
U207 Sensor A Alarms Disabled
U208 High Temperature Sensor A °F
U209 Low Temperature Sensor A °F
U210 High Humidity Sensor A %
U211 Low Humidity Sensor A %
for next/previous unit
then to change parameter
to select parameter
to confirm

Return Sensor Alarms—Enables or disables the return sensor alarms. When enabled the return temperature and humidity values will be compared to a high and low setting.

High Return Temperature—When the return sensor alarm is enabled, the high temperature alarm allows a user to adjust the point at which the actual return temperature activates a High Temperature Alarm.

Low Return Temperature—When the return sensor alarm is enabled, the low temperature alarm allows a user to adjust the point at which the actual return temperature activates a Low Temperature Alarm.

High Return Humidity—When the return sensor alarm is enabled, the high humidity alarm allows a user to adjust the point at which the actual return humidity activates a High Humidity Alarm.

Low Return Humidity—When the return sensor alarm is enabled, the low humidity alarm allows a user to adjust the point at which the actual return humidity activates a Low Humidity Alarm.

Sensor A Alarms—Enables or disables the alarms for reference Sensor A. When enabled, the Sensor A temperature and humidity values will be compared to a high and low settings.

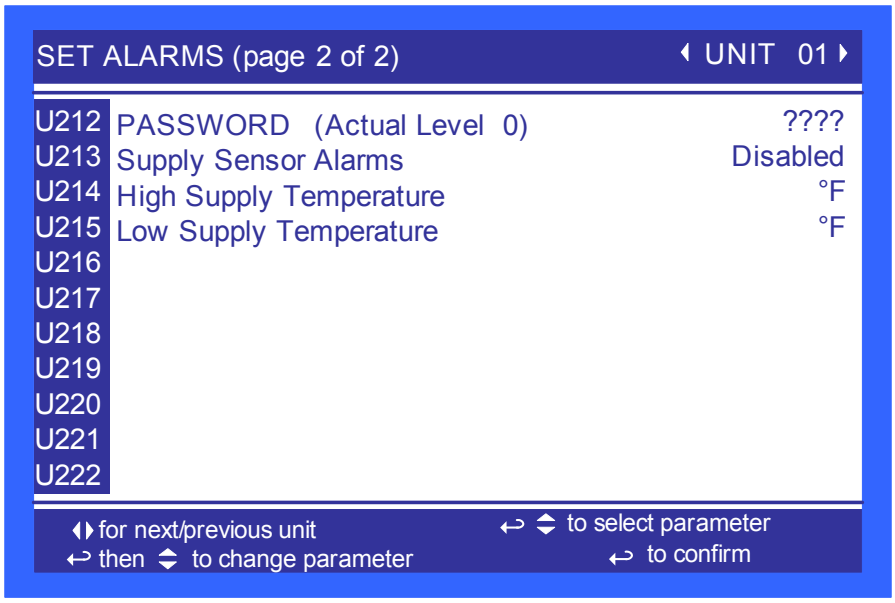
High Temperature Sensor A—When the Sensor A alarm is enabled, the high temperature alarm allows a user to adjust the point at which the actual Sensor A temperature activates a High Temperature Alarm.

Low Temperature Sensor A—When the Sensor A alarm is enabled, the low temperature alarm allows a user to adjust the point at which the actual sensor A temperature activates a Low Temperature Alarm

High Humidity Sensor A—When the Sensor A alarm is enabled, the high humidity alarm allows a user to adjust the point at which the actual Sensor A humidity activates a High Humidity Alarm

Low Humidity Sensor A—When the Sensor A alarm is enabled. the low humidity alarm allows a user to adjust the point at which the actual Sensor A humidity activates a Low Humidity Alarm

Figure 39 Set alarms screen, page 2

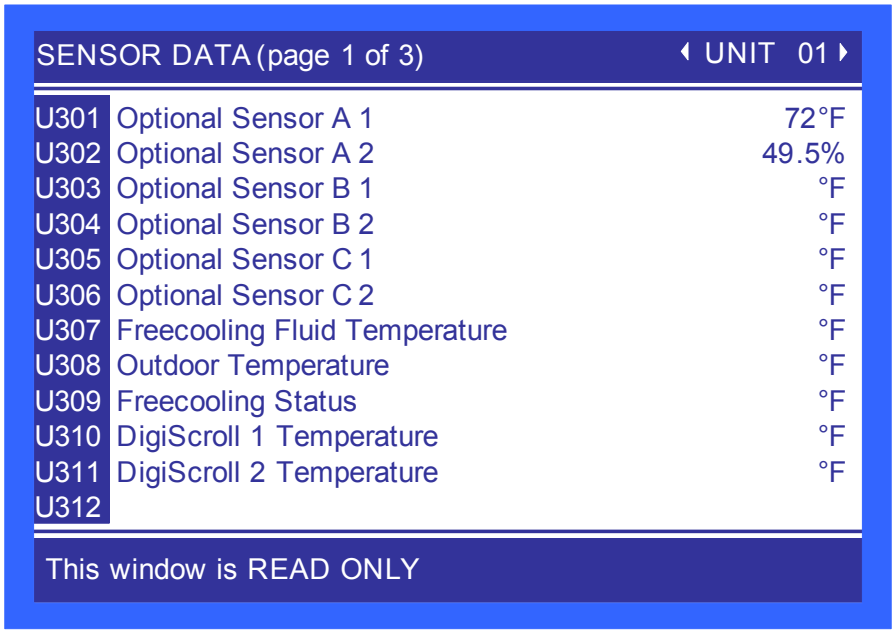


Supply Sensor Alarms—Enables or disables the supply sensor alarms. When enabled, the supply temperature and humidity values will be compared to a high and low setting.

High Supply Temperature—Sets the temperature at which the High Supply Temperature Alarm is activated.

Low Supply Temperature—Sets the temperature at which the Low Supply Temperature Alarm is activated.

Figure 40 Sensor data screen, page 1


SENSOR DATA (page 1 of 3)
UNIT 01
U301 Optional Sensor A 1 72°F
U302 Optional Sensor A 2 49.5%
U303 Optional Sensor B 1 °F
U304 Optional Sensor B 2 °F
U305 Optional Sensor C 1 °F
U306 Optional Sensor C 2 °F
U307 Freecooling Fluid Temperature °F
U308 Outdoor Temperature °F
U309 Freecooling Status °F
U310 DigiScroll 1 Temperature °F
U311 DigiScroll 2 Temperature °F
U312
This window is READ ONLY

Optional Sensor A1—When an optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus, the Sensor A temperature value will be shown. A reference sensor can be connected to any type of Liebert iCOM unit.

Optional Sensor A2—When an optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus, the Sensor A humidity value will be shown. A reference sensor can be connected to any type of Liebert iCOM unit.

Optional Sensor B1—When an optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus the Sensor B temperature value will be shown. A reference sensor can be connected to any type of Liebert iCOM unit.

Optional Sensor B2—When an optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus, the Sensor B humidity value will be shown. A reference sensor can be connected to any type of Liebert iCOM unit.

Optional Sensor C1—When an optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus, the Sensor C temperature value will be shown. A reference sensor can be connected to any type of Liebert iCOM unit.

Optional Sensor C2—When an optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus, the Sensor C humidity value will be shown. A reference sensor can be connected to any type of Liebert iCOM unit.

Freecooling Fluid Temperature—Displays the temperature of the incoming water on units equipped with a free-cooling coil.

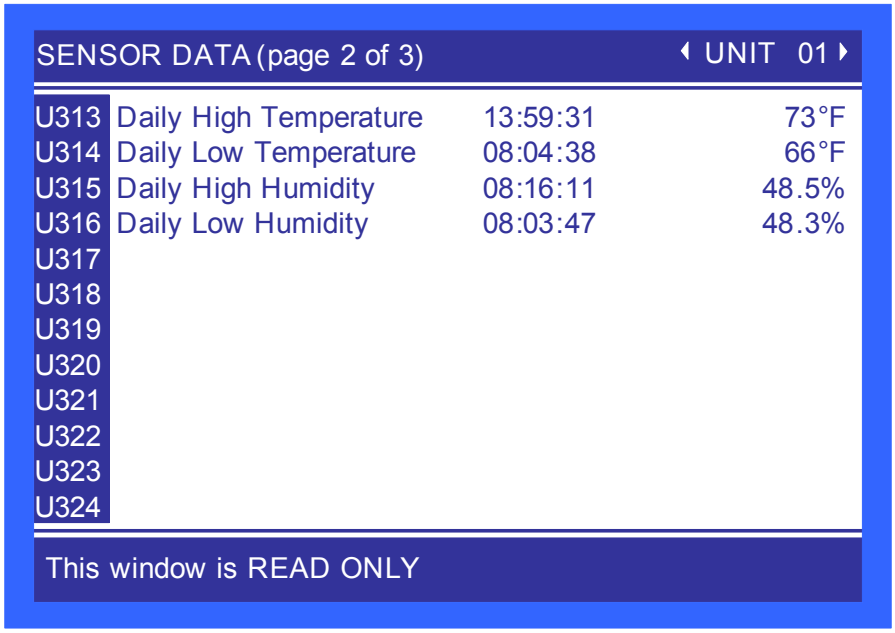
Outdoor Temperature—Reads the outdoor temperature for free-cooling and dual cool units to determine if cooling can be provided without compressor operation. Available only on Liebert HPM units.

Freecooling Status—Displays if free-cooling is available for use based on the return air temperature and the incoming fluid temperature.

Digital Scroll 1 Temperature—Shows the actual digital scroll number 1 discharge temperature on units with digital scroll compressors.

Digital Scroll 2 Temperature—Shows the actual digital scroll number 2 discharge temperature on units with digital scroll compressors.

Figure 41 Sensor data screen, page 2 (return only)



Daily High Temperature—The highest recorded temperature from 12:00 a.m. to 11:59 p.m.

Daily Low Temperature—The lowest recorded temperature from 12:00 a.m. to 11:59 p.m.

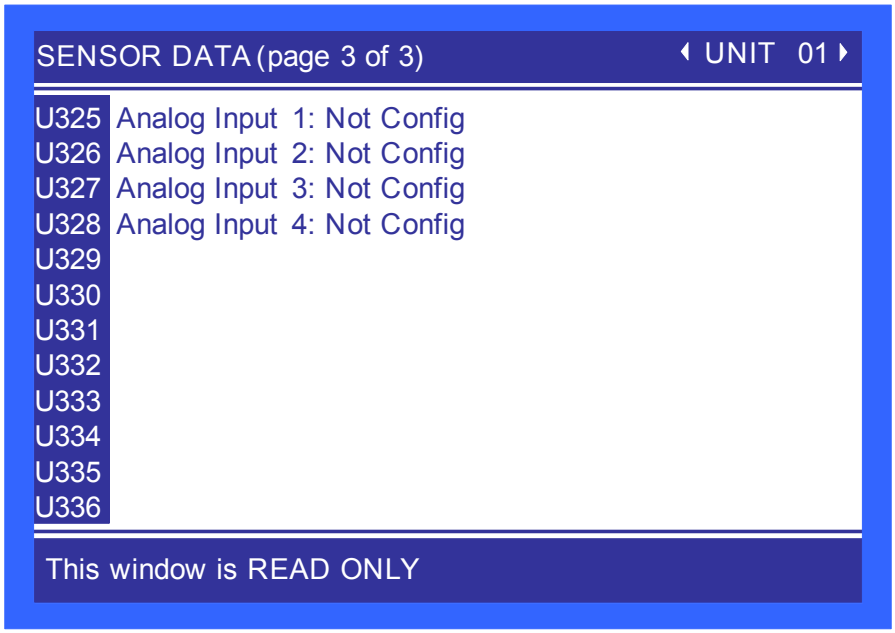
Daily High Humidity—The highest recorded humidity from 12:00 a.m. to 11:59 p.m.

Daily Low Humidity—The lowest recorded humidity in the last 24 hour period.

Active Alarms

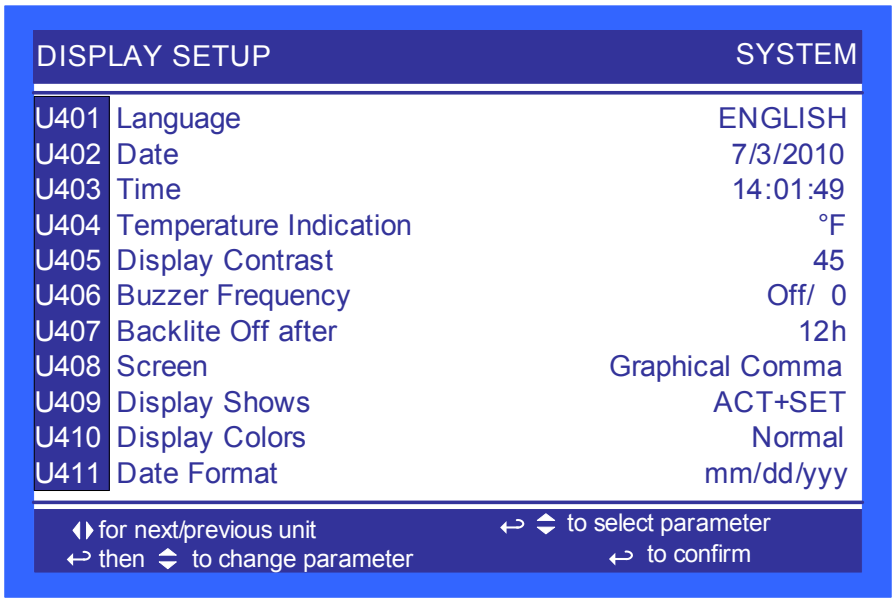
Active Alarms—Permits viewing all current, active alarms.

Figure 42 Sensor data screen, page 3



These parameters show the analog input configured device and the value from the device that is connected. Refer to the **Figures 88** through **92** for a list of analog input devices.

Figure 43 Display setup screen



Language—Sets the language on the display. Changing this parameter changes all menu parameters to the selected language.

Date—Sets the internal date of the unit. If this unit is connected to other units with the unit to unit network connection, all units will reflect the last date set.

Time—This parameter sets the internal time of the unit. If this unit is connected to other units with the unit to unit network connection. All units will reflect the last time set.

Temperature Indication—Selects the actual and set point temperature indication. Selecting C will set the unit to display in Celsius and F will set the unit to display in Fahrenheit.

Display Contrast—Changes the contrast of the display to adjust for different viewing angles, low light and bright light conditions. As the display ages, the contrast may need to be adjusted.

Buzzer Frequency—Changes the audible noise frequency of the built in buzzer. When adjusting the buzzer frequency the buzzer will sound allowing selection of a frequency that is easily detected when an alarm occurs.

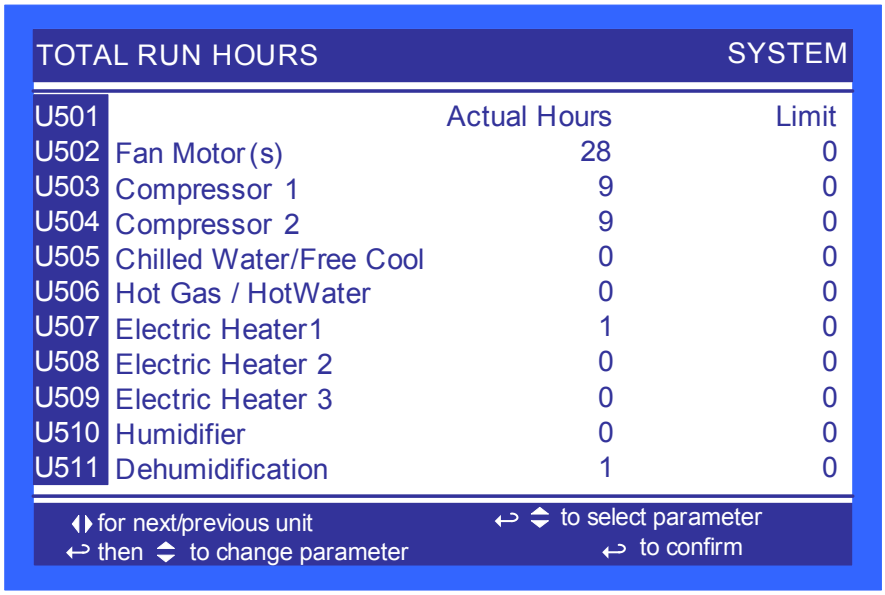
Backlite Off After X Hours—Controls the length of time that the back-light remains active when the display is unused. When the buttons on the front display have not been pressed for the time selected in this parameter, the back-light will turn Off, extending the life of the display and saving energy.

Display Shows—Selects if the main display shows the temperature and humidity actual values only, setpoint values only or both actual and setpoint.

Display Colors—Selects the background color. Inverted sets the display to show white font with blue background; Normal sets a white background with blue font.

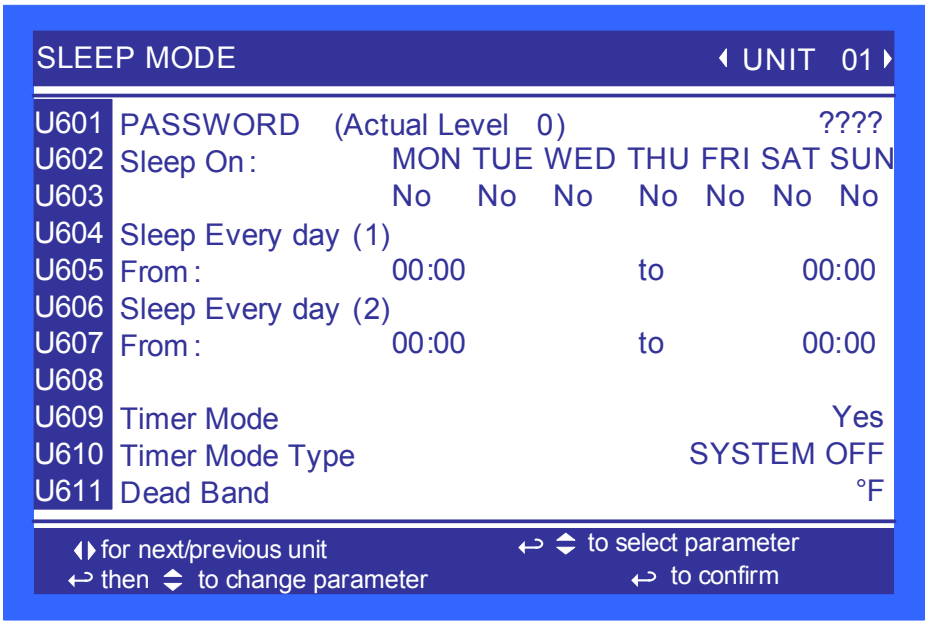
Date Format—Changes the month, day and year arrangement shown on the front display and event time stamps.

Figure 44 Total run hours screen



Displays the cumulative hours a particular component has been operating and the limit placed on the hours the component may operate.

Figure 45 Sleep mode screen


SLEEP MODE
UNIT 01
U601 PASSWORD (Actual Level 0) ????
U602 Sleep On: MON TUE WED THU FRI SAT SUN
U603 No No No No No No No
U604 Sleep Every day (1)
U605 From: 00:00 to 00:00
U606 Sleep Every day (2)
U607 From: 00:00 to 00:00
U608
U609 Timer Mode Yes
U610 Timer Mode Type SYSTEM OFF
U611 Dead Band °F
for next/previous unit
then to change parameter
to select parameter
to confirm

Displays the periods a unit is in sleep mode each day of the week.

8.0 SERVICE MENU PARAMETERS

Service menus allow customized settings for site operations. The password for service menu parameters is **5010.**

The Liebert iCOM firmware is being updated constantly. As a result, the Service menu parameter tables shown in this manual may be slightly different than what is shown on your cooling unit's display. Please check **www.liebert.com** for the latest Liebert iCOM User manual updates.

Figure 46 Service Menu Main Screen

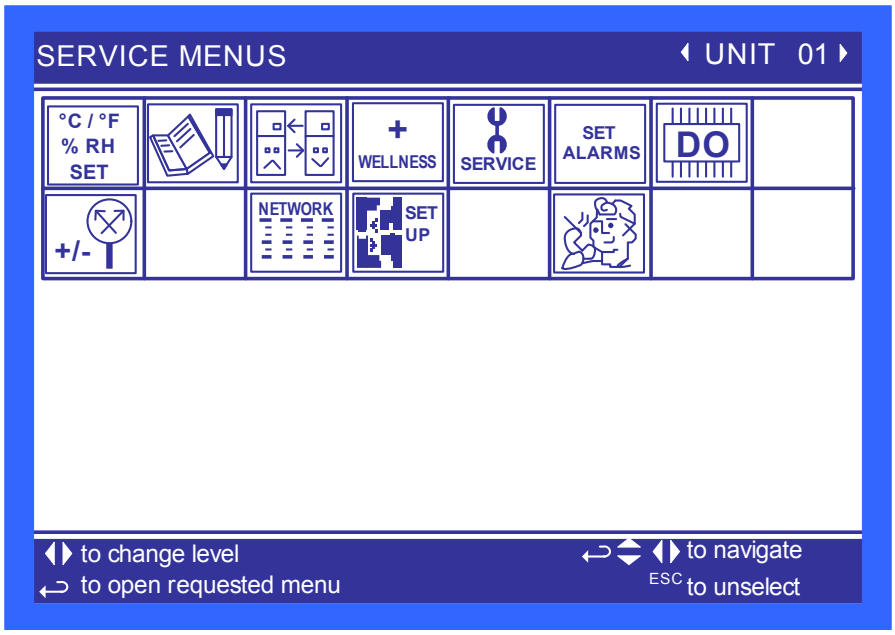
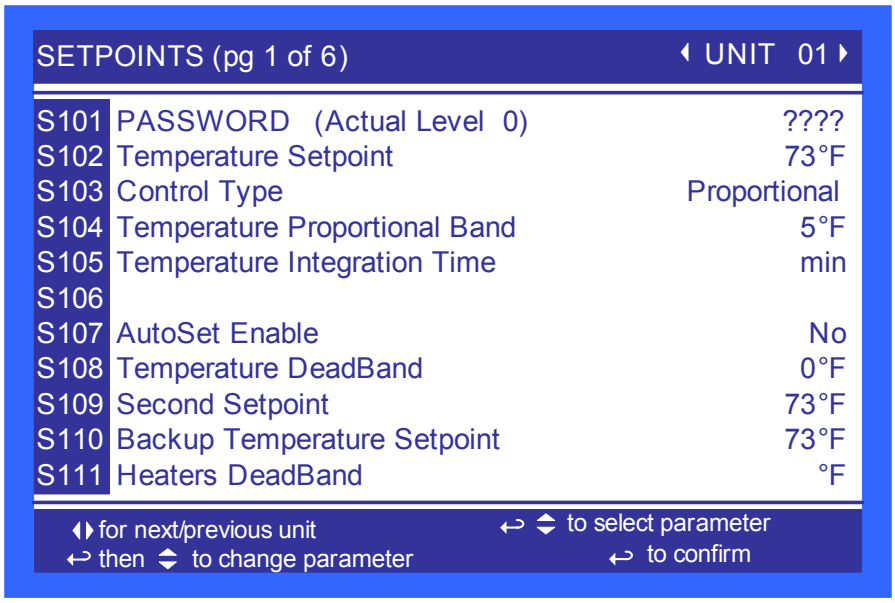


Figure 47 Setpoints screen, page 1 of 6



Temperature Setpoint—Selects a return temperature that the cooling unit will maintain by applying cooling and or reheats. This is adjustable from 41-104°F (5-40°C); the factory default is 73°F (22.7°C).

Control Type—Selects the type of control the system will use to activate cooling or heating. A detailed description of each control type can be found in **3.6 - Control Types**.

Temperature Proportional Band—Adjusts the activation points of compressors or rate of change based on the actual sensor values deviation from setpoint. The smaller this number the faster the compressors and valve(s) will increase capacity. Too small of a number may cause the unit to short cycle the compressors or excessively reposition the valve.

Temperature Integration Time—Adjusts the capacity of the unit based on time away from setpoint so that accurate temperature control can be maintained. This parameter is active when Control Type is set to "PI".

AutoSet Enable—Sets the temperature and humidity proportional bands automatically based on the type of unit when this parameter is set to "YES" and if teamwork modes are selected. To change the proportional bands, this parameter must be set to "NO".

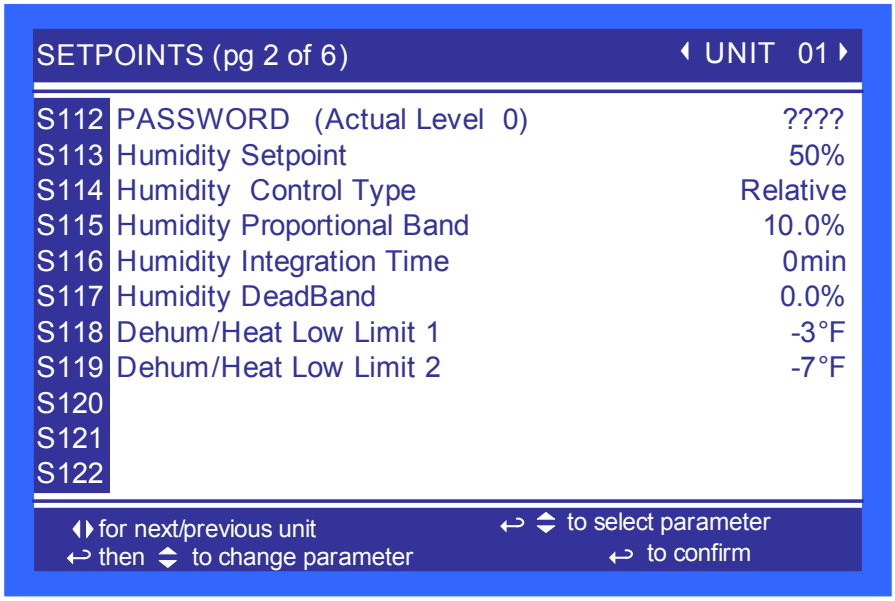
Temperature Deadband—Avoids overshooting of the setpoint and cycling between the reheats and cooling. The value entered in this field will be split in half by the temperature setpoint. Example—If the temperature setpoint is 70°F (21.1°C) and a 4°F (2.2°C) deadband is set, then no cooling will be activated until 72°F (22.2°C) and no heating will be activated until 68°F (20°C) is reached.

Second Setpoint—Selects a temperature setpoint that will be activated in the event of a customer input signal configured as the 2nd Setpoint. The customer input must be configured for this parameter to activate. This parameter is adjustable from 41-104°F (5-40°C). The factory default setting is 73°F (22.7°C).

Backup Temperature Setpoint—Selects a temperature setpoint that will be activated in the event of a BMS Timeout. The BMS timer must be configured for this parameter to activate. This parameter is adjustable from 41-104°F (5-40°C). The factory default setting is 73°F (22.7°C).

Heaters Deadband—Changes the amount of deviation below the temperature setpoint that the heaters will cycle On and Off on Liebert HPM units. This value is added to the heating side of the normal temperature deadband.

Figure 48 Setpoints screen, page 2 of 6



Humidity Setpoint—Selects a humidity that the cooling unit will maintain by removing or adding moisture to the air. This parameter is adjustable from 20-80%. The factory default setting is 50%.

Humidity Control Type—Selects the humidity control calculation. Setting this parameter to "Relative" will control the humidity without considering any temperature deviations. "Predictive" and "Absolute" control consider the temperature deviation from temperature setpoint so that a constant level of moisture is kept in the area based on the humidity sensor reading and the temperature deviation from setpoint. The factory default setting is "Predictive" (see **3.6.2 - Humidity Sensor Reading Control Types**).

Humidity Proportional Band—Adjusts the activation points of the humidifier and compressors based on the actual sensor values deviation from setpoint. The smaller this number the faster the compressors and humidifier will increase capacity, too small of a number may cause the unit to short cycle or overshoot setpoint.

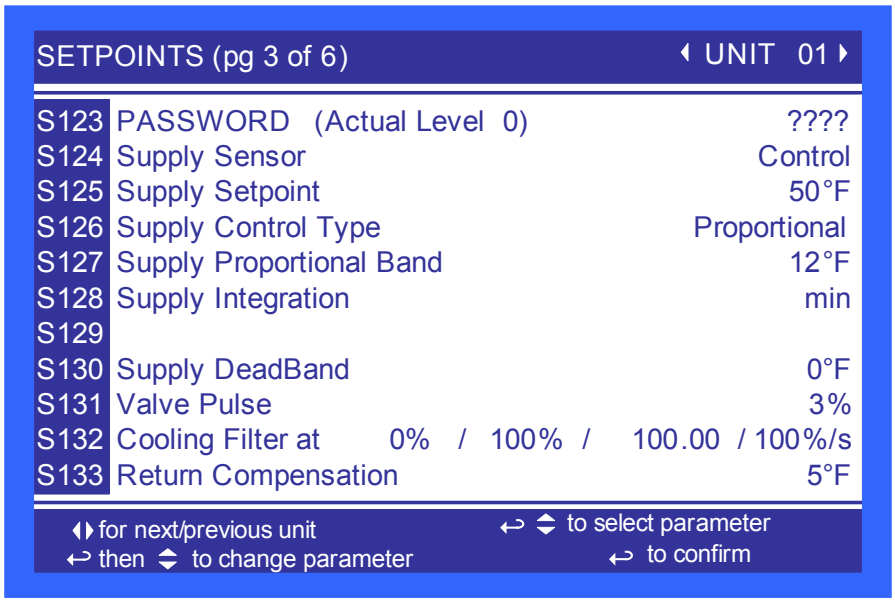
Humidity Integration Time—Adjusts the capacity of the unit based on time away from setpoint so that accurate humidity control can be maintained. If the integration time is set to 0, the humidity control operates as a "proportional only" control. When an integration time is set the control mode changes to "PI" control.

Humidity Deadband—Prevents overshooting of the setpoint and cycling between humidification and dehumidification. The value entered in this field will be split in half by the temperature setpoint. Example: If the humidity setpoint is 50% and a 4% deadband is set, then the dehumidification proportional range will be from 52 to 57% and the humidification proportional range will be from 48 to 43%.

Dehum/Heat Low Limit 1—Sets the temperature at which one of two compressors will be deactivated for dehumidification control. Unit must be set for two-compressor dehumidification for this value to be settable. Example—If Low Limit 1 is set to 4°F (2.2°C) and the temperature setpoint is 70°F (21.1°C) then one of the two compressors will turn off at 66°F (18.8°C).

Dehum/Heat Low Limit 2—Sets the temperature at which dehumidification is stopped. Example—If Low Limit 2 is set to 8°F (4.4°C) and the temperature setpoint is 70°F (21.1°C) then all dehumidification will be deactivated at 62°F (16.6°C).

Figure 49 Setpoints screen, page 3 of 6


SETPOINTS (pg 3 of 6)
UNIT 01
S123 PASSWORD (Actual Level 0) ????
S124 Supply Sensor Control
S125 Supply Setpoint 50°F
S126 Supply Control Type Proportional
S127 Supply Proportional Band 12°F
S128 Supply Integration min
S129
S130 Supply DeadBand 0°F
S131 Valve Pulse 3%
S132 Cooling Filter at 0% / 100% / 100.00 / 100%/s
S133 Return Compensation 5°F
for next/previous unit
then to change parameter
to select parameter
to confirm

Supply Sensor—Selects how the supply sensor will be used by the control. The choices are Disabled, Cooling Only, Control and Limit. See **3.7 - Supply Control** for a detailed description. The supply sensor can only be set to Cooling Only and Control on chilled water units. The chilled water unit must have the valve feedback if the valve type is a 3P valve (actuator). Proportional control actuators used on motorized ball valves do not require the feedback feature.

Supply Setpoint—Sets the temperature setpoint for the supply sensor when it is set to Cooling Only, Control or Limit.

Supply Control Type—Selects the type of control the system will use to activate cooling. A detailed description of each control type can be found in **3.6 - Control Types**.

Supply Proportional Band—Adjusts the valve's rate of change based on the actual sensor values deviation from setpoint when the supply sensor is set to Cooling Only or Control. The smaller this number, the faster the valve(s) will increase cooling capacity. Too small of a number may cause the unit to excessively reposition the valve.

Supply Integration—Adjusts the capacity of the unit based on time away from setpoint so that accurate temperature control can be maintained. This parameter is active only when Control Type is set to "PI."

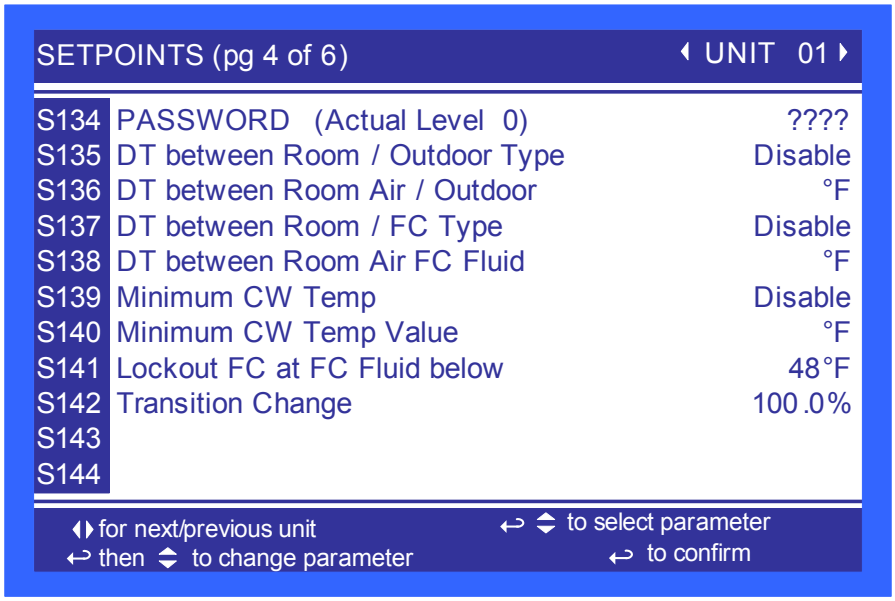
Supply Deadband—Prevents overshooting of the setpoint and cycling between the reheats and cooling. The value entered into this field will be split in half by the temperature setpoint. Example: If the temperature setpoint is 60°F (15.5°C) and a 4°F (2.2°C) deadband is set then no cooling will be activated until 62°F (16.6°C) and no heating will be activated until 58°F (14.4°C) is reached.

Valve Pulse—Defines the minimum change in the cooling requirement before the valve will reposition. A greater number decreases the amount of repositions and a smaller number will increase the response of the valve.

Cooling Filter at 0% / 100%—Controls the rate of change during a valve position adjustment to avoid overshoots. The filter value depends on the current control deviation from the setpoint. On the setpoint (at 0%), it's typically set lower (slow), and at the end of the P-band (at 100%), it's typically set higher (faster). The value is given in % control output change per second.

Return Compensation—For supply control only. Defines the maximum increase allowed to the supply temperature setting to maintain a minimum return temperature setpoint. When the return air temperature is above its setpoint, the supply air setpoint remains unchanged. As the return air temperature drops below the setpoint, the supply air setpoint will be proportionally increased to maintain the return temperature setpoint. The maximum increase is defined with the return compensation parameter.

Figure 50 Setpoints screen, page 4 of 6


SETPOINTS (pg 4 of 6)
UNIT 01
S134 PASSWORD (Actual Level 0) ????
S135 DT between Room / Outdoor Type Disable
S136 DT between Room Air / Outdoor °F
S137 DT between Room / FC Type Disable
S138 DT between Room Air FC Fluid °F
S139 Minimum CW Temp Disable
S140 Minimum CW Temp Value °F
S141 Lockout FC at FC Fluid below 48°F
S142 Transition Change 100.0%
S143
S144
for next/previous unit
then to change parameter
to select parameter
to confirm

DT between Room / Outdoor Type—This feature is used only on Liebert HPM products.

DT between Room Air / Outdoor—This feature is used only on Liebert HPM products.

DT between Room / FC Type—Determines the method to activate the water circuit on Dual-Cool and free-cool units. When this parameter is set to "Contact," a dry contact closure can be used to activate the free cooling circuit. When this parameter is set to "Value," the delta between the water temperature of the free-cool circuit and the actual room temperature are compared.

DT between Room Air / FC Fluid—Sets the delta between the actual room temperature and the free-cooling fluid temperature to determine if cooling can be provided.

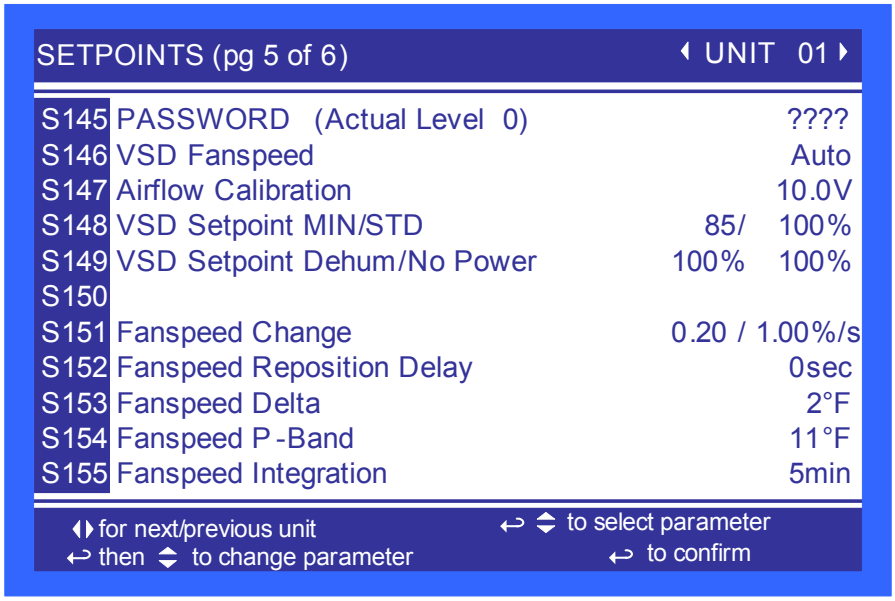
Minimum CW Temp—Enables the temperature at which free-cooling can operate independently without assistance of the compressor circuit.

Minimum CW Temp Value—Sets the water temperature at which 100% free-cooling can be provided to handle the full room load. When the fluid temperature is below this setting then the compressors will no longer turn on until the water temperature is above the minimum CW Temp.

Lockout FC at FC Fluid below—The temperature that turns off the free-cooling circuit when the water temperature is too low. This setting prevents frost from building up on the free-cooling pipes when the outdoor ambient is extremely low.

Transition Change—Applied over the "Cooling Filter at 0% / 100%" when the cooling signal makes the transition between cooling and dehumidification. This will smooth the cooling capacity changes between dehumidification and cooling.

Figure 51 Setpoints screen, page 5 of 6


SETPOINTS (pg 5 of 6)
UNIT 01
S145 PASSWORD (Actual Level 0) ????
S146 VSD Fanspeed Auto
S147 Airflow Calibration 10.0V
S148 VSD Setpoint MIN/STD 85/ 100%
S149 VSD Setpoint Dehum/No Power 100% 100%
S150
S151 Fanspeed Change 0.20 / 1.00%/s
S152 Fanspeed Reposition Delay 0sec
S153 Fanspeed Delta 2°F
S154 Fanspeed P-Band 11°F
S155 Fanspeed Integration 5min
for next/previous unit
then to change parameter
to select parameter
to confirm

VSD Fanspeed—Sets the control type for a Variable Fanspeed device, which includes Variable Frequency Drives and EC fans. Selection options are Auto, Manual, Economy, Delta, Return and Supply control. See **3.1.1 - Unit/Fan Control** for details of each control.

Airflow Calibration—Allows the front display to be scaled to show the actual percentage of airflow independent of the voltage operating the fan speed. This value cannot be set above the Analog Output High Limit or below the Analog Low Limit for the fan set in the Advanced Menu.

VSD Setpoint MIN/STD—Sets the fanspeed for the VSD. "MIN" sets the minimum speed that the fan will operate at. Fan speed is modulated between the "VSD Setpoint MIN" and "VSD Setpoint STD" based on either the call for cooling (Auto Control) or other fanspeed control settings determined by the VSD Fanspeed. When VSD Fanspeed is set to Auto, Economy or Delta control, the "STD" setting on this parameter is the high limit for the fan speed output. If VSD Fanspeed is set to Manual, this parameter is the actual running speed of the fan. The VSD Setpoint MIN and STD settings are expressed as a percentage of the Airflow Calibration setting.

VSD Setpoint Dehum/No Power—Sets the fixed fan speed the fan will operate at when there is a call for dehumidification. The factory default setting for chilled water units is 60% which helps to keep the coil in a latent or dehumidification mode. When set to "No Power," this parameter sets the fan speed applied when a Customer Input set to "No Power" is activated. These settings are expressed as a percentage of the Airflow Calibration setting.

NOTE

Fixed fan speeds are also set during Heating and Humidification modes. These settings are determined by the manufacturer to prevent excessive heater temperatures and condensation and are typically set at 100% fanspeed.

Fanspeed Change at 0% / 100%—Controls the rate of change during a fan speed adjustment to avoid overshoots. The filter value depends on the current control deviation from the setpoint. On the setpoint (at 0%), it's typically set lower (slow), and at the end of the P-band (at 100%), it's typically set higher (faster). The value is given in % control output change per second.

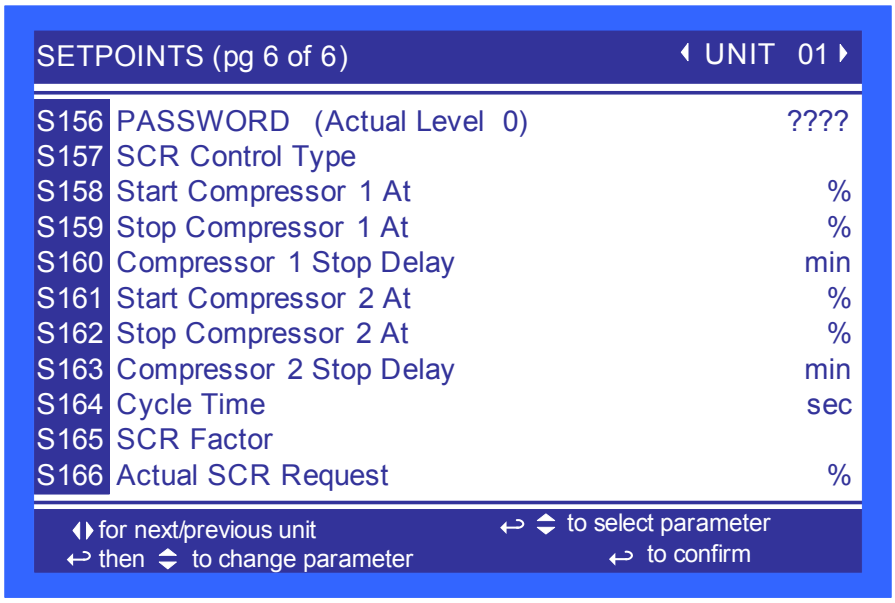
Fanspeed Reposition Delay—Sets the reposition delay that is applied only for changes to decrease fanspeed; increases in fanspeed are controlled only by the fanspeed change speed filter. After fanspeed is increased, the timer will prevent the speed from being reduced for the delay duration.

Fanspeed Delta—Sets the temperature delta between the two cold aisle containment sensors. This delta is maintained to ensure that there is sufficient airflow inside the containment area.

Fanspeed P-Band—Sets the proportional band when fanspeed is in Delta control mode.

Fanspeed Integration—Sets the integration time when fanspeed is in Delta control mode.

Figure 52 Setpoints screen, page 6 of 6


SETPOINTS (pg 6 of 6)
UNIT 01
S156 PASSWORD (Actual Level 0) ????
S157 SCR Control Type
S158 Start Compressor 1 At %
S159 Stop Compressor 1 At %
S160 Compressor 1 Stop Delay min
S161 Start Compressor 2 At %
S162 Stop Compressor 2 At %
S163 Compressor 2 Stop Delay min
S164 Cycle Time sec
S165 SCR Factor
S166 Actual SCR Request %
for next/previous unit
then to change parameter
to select parameter
to confirm

SCR Control Type—Sets the control type for the SCR reheats. If set to "Standard," then the reheats will modulate when the temperature is below setpoint based on the control settings. If this parameter is set to "Tight" control then one compressor will be locked on and the reheats will modulate to offset the cooling capacity.

Start Compressor 1 / 2 at—Sets the activation point of the compressor. This parameter can be used when set to "Tight" control.

Stop Compressor 1 / 2 at—Sets the deactivation point of the compressor. This parameter can be used when set to "Tight" control.

Compressor 1 / 2 stop delay—Sets the delay when the stop compressor setpoint is met.

Cycle time—Set at the factory and should be changed only by an authorized Liebert representative.

SCR Factor—Set at the factory and should be changed only by an authorized Liebert representative.

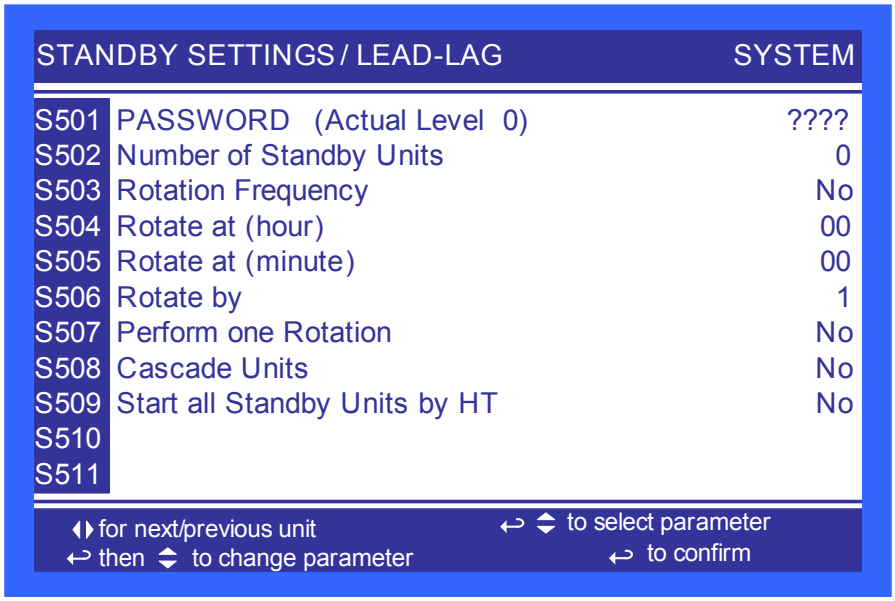
Unit Diary—Large Display Only

Shows all entered program changes and maintenance performed on the unit.

Table 16 Unit diary parameters

Function		Range Imperial (metric)
Large Display	Small Display	
Page 1 of 1		
Text entered with iST (Liebert iCOM Service Tool)	N/A	-

Figure 53 Standby settings / lead-lag screen


STANDBY SETTINGS / LEAD-LAG SYSTEM
S501 PASSWORD (Actual Level 0) ????
S502 Number of Standby Units 0
S503 Rotation Frequency No
S504 Rotate at (hour) 00
S505 Rotate at (minute) 00
S506 Rotate by 1
S507 Perform one Rotation No
S508 Cascade Units No
S509 Start all Standby Units by HT No
S510
S511
for next/previous unit
then to change parameter
to select parameter
to confirm

Number of Standby Units—Selects the number of units that will be in Standby mode. When a unit is in standby mode, the fan will be Off and no cooling will be provided.

Rotation Frequency—Controls when a rotation will occur between the standby units and the operating units within a network.

Rotate at (hour)—Sets the hour of the rotation

Rotate at (minute)—Sets the minute of the rotation.

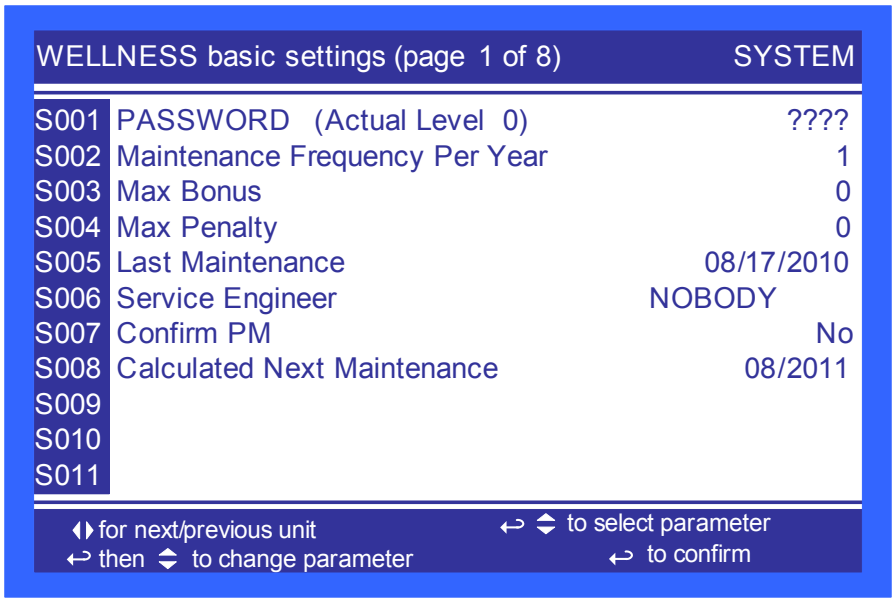
Rotate by—Determines the number of positions to rotate by. Example: If there are 6 units in a unit-to-unit network and units 1, 3 and 5 are in standby and this parameter is set to "1," then at the next rotation units 2, 4 and 6 will be placed in standby and units 1, 3 and 5 will become operational.

Cascade Units—Allows units to activate in Standby mode if the room temperature cannot be maintained by the non-standby units. If "Yes" is selected, the cascade units can perform all functions when activated from standby. This parameter can also be set for Cooling Only or Cool / Heat only.

Start all Standby Units by HT—Activates all units to cool when a High Temperature Alarm occurs.

See **3.10.1 - Calculating Next Maintenance and Diagnostics** for details on these menus.

Figure 54 Wellness—Basic settings screen, page 1 of 8



Maximum Frequency Per year—Sets the number of expected maintenance visits in a one year time span.

Max Bonus—Increase the time to the next maintenance cycle. Service personnel should assign a bonus when a service visit finds that all components are working optimally.

Max Penalty—Decrease the time to the next maintenance cycle. Service personnel should assign a penalty when a service visit finds excessive wear on components.

Last Maintenance—Indicates to service personnel the date of the last visit. This parameter is set during the service call.

Service Engineer—Provides a label for the service representative to list either the company name or representative's name.

Confirm PM—Confirms that the service representative has completed the preventive maintenance and resets the next maintenance date.

Calculated Next Maintenance—Provides a date to when the next expected maintenance should take place based on the last confirmed PM, component starts, run hours and the penalty / bonus currently set in the Liebert iCOM.

Figure 55 Wellness—Motor settings screen, page 2 of 8

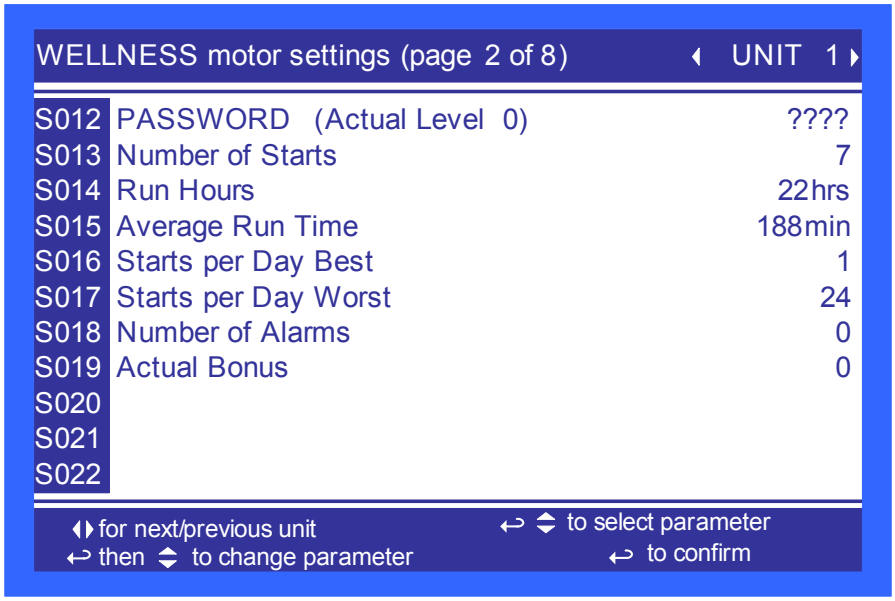


Figure 56 Wellness—Compressor 1 settings screen, page 3 of 8

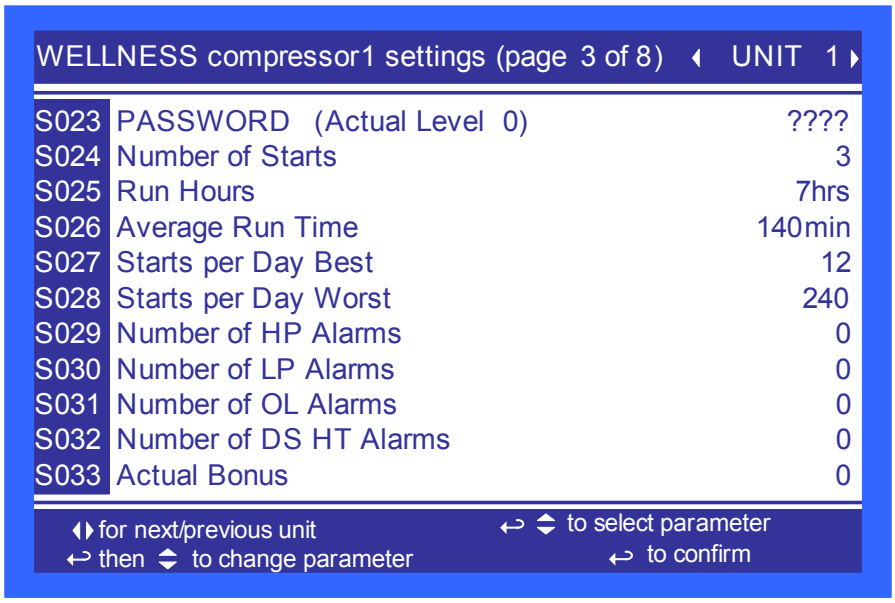

WELLNESS compressor1 settings (page 3 of 8) UNIT 1
S023 PASSWORD (Actual Level 0) ????
S024 Number of Starts 3
S025 Run Hours 7hrs
S026 Average Run Time 140min
S027 Starts per Day Best 12
S028 Starts per Day Worst 240
S029 Number of HP Alarms 0
S030 Number of LP Alarms 0
S031 Number of OL Alarms 0
S032 Number of DS HT Alarms 0
S033 Actual Bonus 0
for next/previous unit
then to change parameter
to select parameter
to confirm

Figure 57 Wellness—Compressor 2 settings screen, page 4 of 8

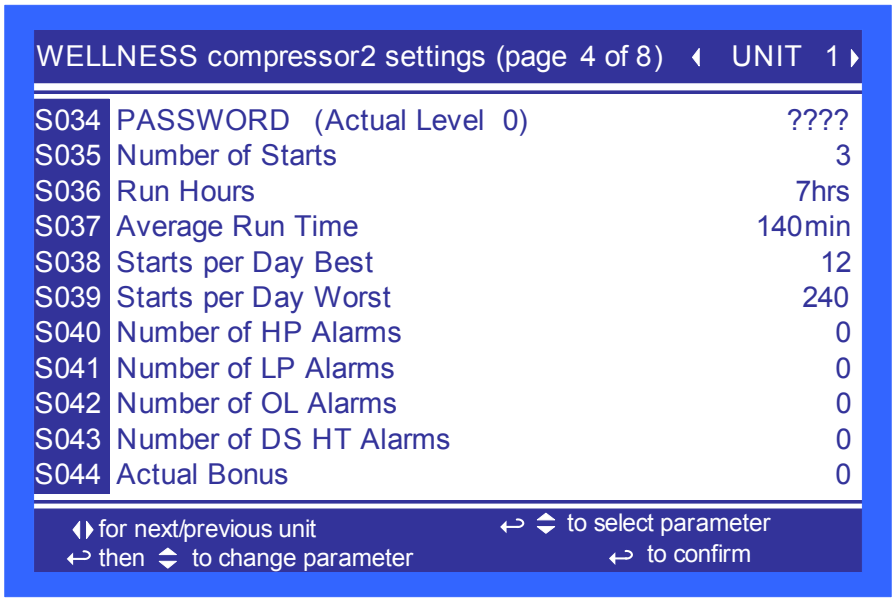

WELLNESS compressor2 settings (page 4 of 8) UNIT 1
S034 PASSWORD (Actual Level 0) ????
S035 Number of Starts 3
S036 Run Hours 7hrs
S037 Average Run Time 140min
S038 Starts per Day Best 12
S039 Starts per Day Worst 240
S040 Number of HP Alarms 0
S041 Number of LP Alarms 0
S042 Number of OL Alarms 0
S043 Number of DS HT Alarms 0
S044 Actual Bonus 0
for next/previous unit
then to change parameter
to select parameter
to confirm

Figure 58 Wellness—Electric heater 1 settings screen, page 5 of 8

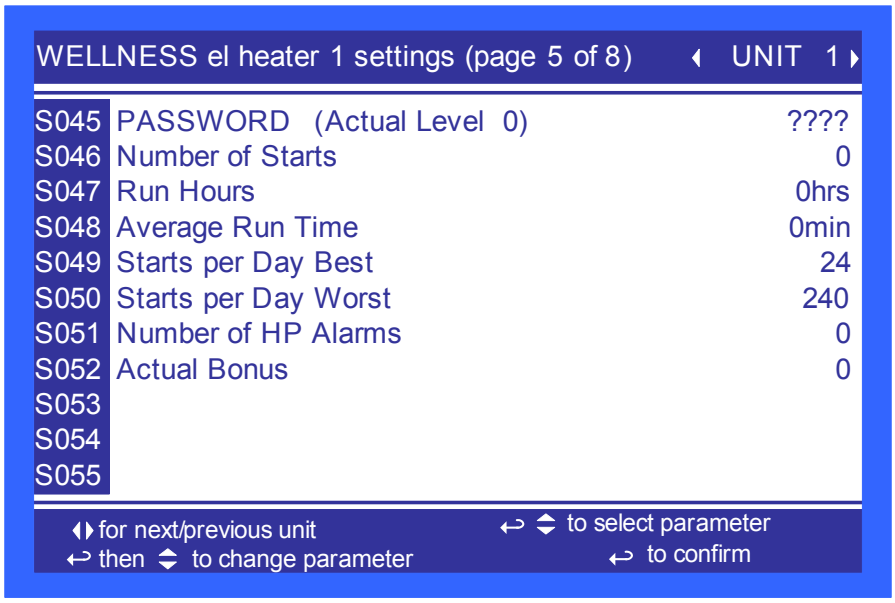

WELLNESS el heater 1 settings (page 5 of 8)
UNIT 1
S045 PASSWORD (Actual Level 0) ????
S046 Number of Starts 0
S047 Run Hours 0hrs
S048 Average Run Time 0min
S049 Starts per Day Best 24
S050 Starts per Day Worst 240
S051 Number of HP Alarms 0
S052 Actual Bonus 0
S053
S054
S055
for next/previous unit
then to change parameter
to select parameter
to confirm

Figure 59 Wellness—Electric heater 2 settings screen, page 6 of 8

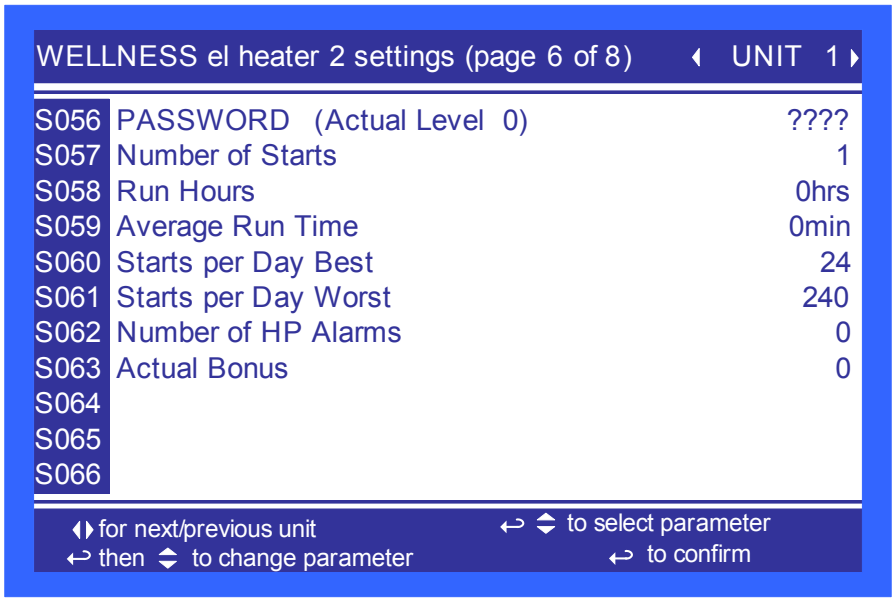

WELLNESS el heater 2 settings (page 6 of 8)
UNIT 1
S056 PASSWORD (Actual Level 0) ????
S057 Number of Starts 1
S058 Run Hours 0hrs
S059 Average Run Time 0min
S060 Starts per Day Best 24
S061 Starts per Day Worst 240
S062 Number of HP Alarms 0
S063 Actual Bonus 0
S064
S065
S066
for next/previous unit
then to change parameter
to select parameter
to confirm

Figure 60 Wellness—Electric heater 3 settings screen, page 7 of 8

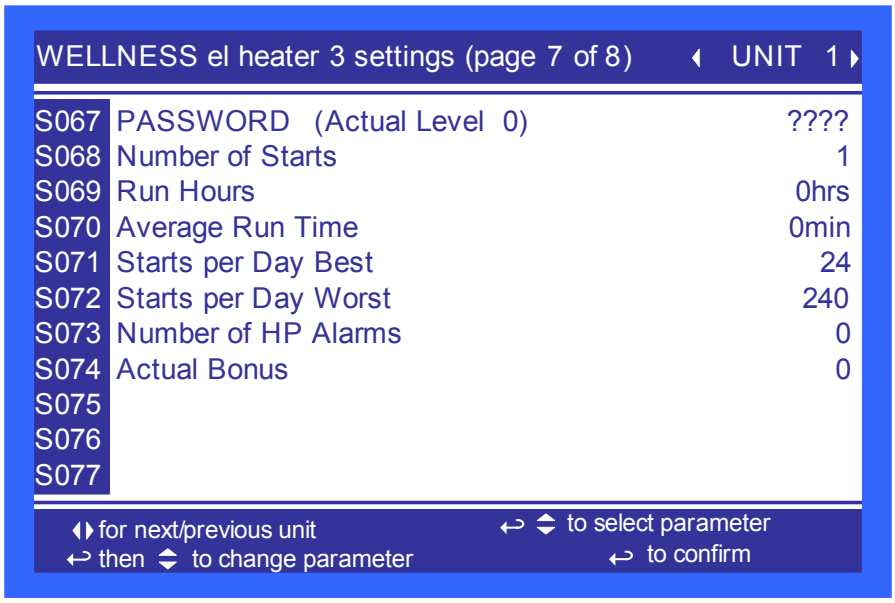

WELLNESS el heater 3 settings (page 7 of 8)
UNIT 1
S067 PASSWORD (Actual Level 0) ????
S068 Number of Starts 1
S069 Run Hours 0hrs
S070 Average Run Time 0min
S071 Starts per Day Best 24
S072 Starts per Day Worst 240
S073 Number of HP Alarms 0
S074 Actual Bonus 0
S075
S076
S077
for next/previous unit
then to change parameter
to select parameter
to confirm

Figure 61 Wellness—Humidifier settings screen, page 8 of 8

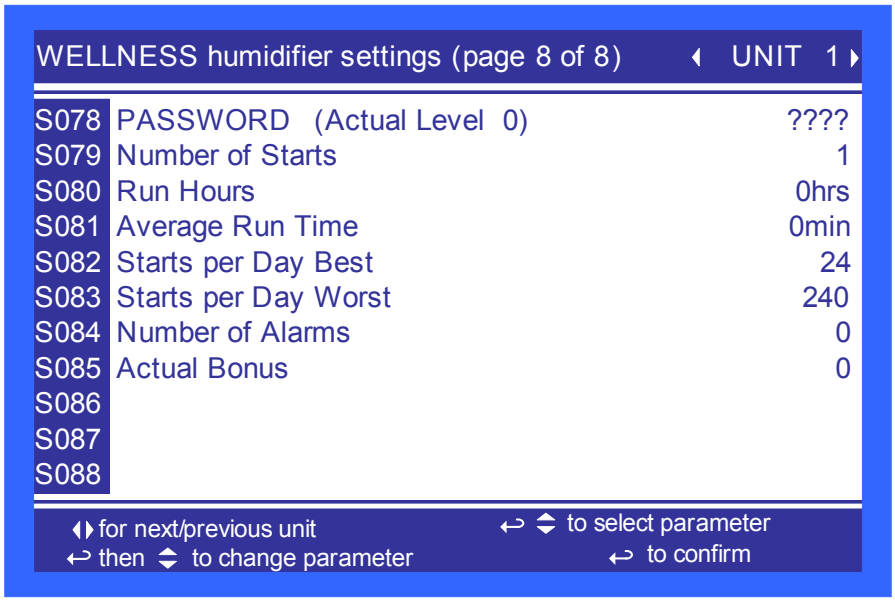
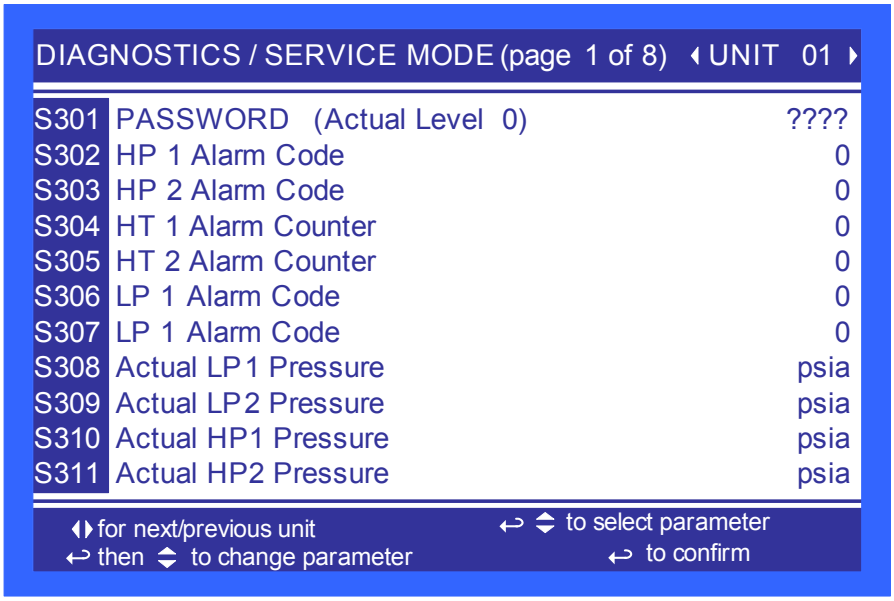


Figure 62 Diagnostics/service mode screen, page 1 of 8


DIAGNOSTICS / SERVICE MODE (page 1 of 8) UNIT 01
S301 PASSWORD (Actual Level 0) ????
S302 HP 1 Alarm Code 0
S303 HP 2 Alarm Code 0
S304 HT 1 Alarm Counter 0
S305 HT 2 Alarm Counter 0
S306 LP 1 Alarm Code 0
S307 LP 1 Alarm Code 0
S308 Actual LP1 Pressure psia
S309 Actual LP2 Pressure psia
S310 Actual HP1 Pressure psia
S311 Actual HP2 Pressure psia
for next/previous unit
then to change parameter
to select parameter
to confirm

HP 1 Alarm Code—Compressor 1 high pressure alarm code: 0 = no alarm; 2 = high-pressure alarm active.

HP 2 Alarm Code—Compressor 2 high pressure alarm code: 0 = no alarm; 2 = high-pressure alarm active.

HT 1 Alarm Counter—Compressor 1 high temperature event alarm counter. If more than five events in a rolling 4 hour period occur then the compressor will be locked out.

HT 2 Alarm Counter—Compressor 2 high temperature event alarm counter. If more than five events in a rolling 4 hour period occur then the compressor will be locked out.

LP 1 Alarm Code—Compressor 1 low-pressure alarm code: 0 = no alarm; 2 = low-pressure alarm active.

LP 2 Alarm Code—Compressor 2 low-pressure alarm code: 0 = no alarm; 2 = low-pressure alarm active.

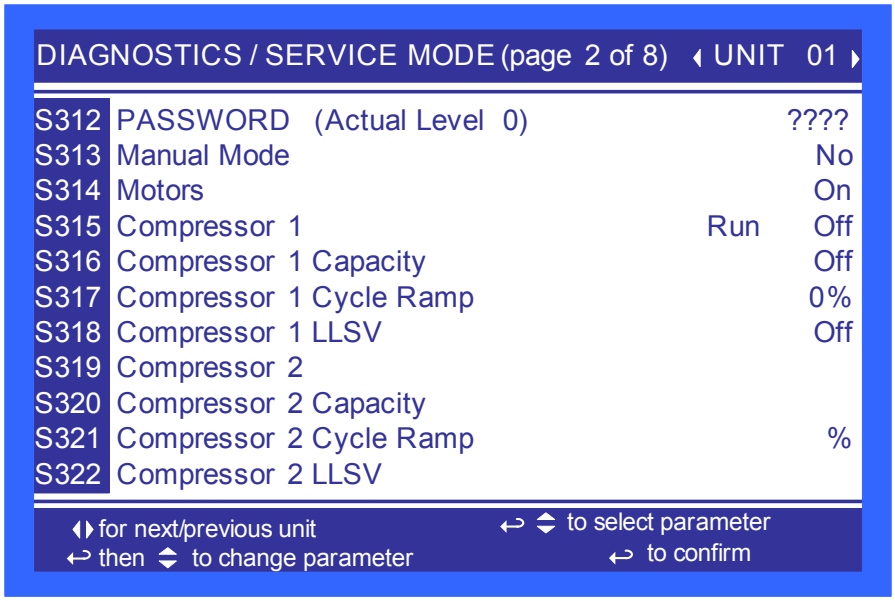
Actual LP1 Pressure—Current refrigerant low pressure side reading in atmosphere for Compressor 1.

Actual LP2 Pressure—Current refrigerant low pressure side reading in atmosphere for Compressor 2.

Actual HP1 Pressure—Current refrigerant high pressure side liquid reading in atmosphere for Compressor 1. (This is available only on water cooled units equipped with motorized ball valves.)

Actual HP2 Pressure—Current refrigerant high pressure side liquid reading in atmosphere for Compressor 2. (This is available only on water-cooled units equipped with motorized ball valves.)

Figure 63 Diagnostics/service mode screen, page 2 of 8


DIAGNOSTICS / SERVICE MODE (page 2 of 8) UNIT 01
S312 PASSWORD (Actual Level 0) ????
S313 Manual Mode No
S314 Motors On
S315 Compressor 1 Run Off
S316 Compressor 1 Capacity Off
S317 Compressor 1 Cycle Ramp 0%
S318 Compressor 1 LLSV Off
S319 Compressor 2
S320 Compressor 2 Capacity
S321 Compressor 2 Cycle Ramp %
S322 Compressor 2 LLSV
for next/previous unit
then to change parameter
to select parameter
to confirm

Manual Mode—Places the Liebert iCOM in manual mode. This is the initial setting necessary to activate any of the following items.

Motor(s)—Starts the unit's main fan. The main fan must be On before any of the following overrides can be activated.

Compressor 1—Turns on Compressor 1 and selects the mode of compressor operation. The choices are RUN, EVACUATE and CHARGE.

Compressor 1 Capacity—Enable Compressor 1 Cycle Ramp.

Compressor 1 Cycle Ramp—Select the capacity the compressor should run at. The range is 0 to 100%.

Compressor 1 LLSV—Control the liquid line solenoid valve for Compressor 1.

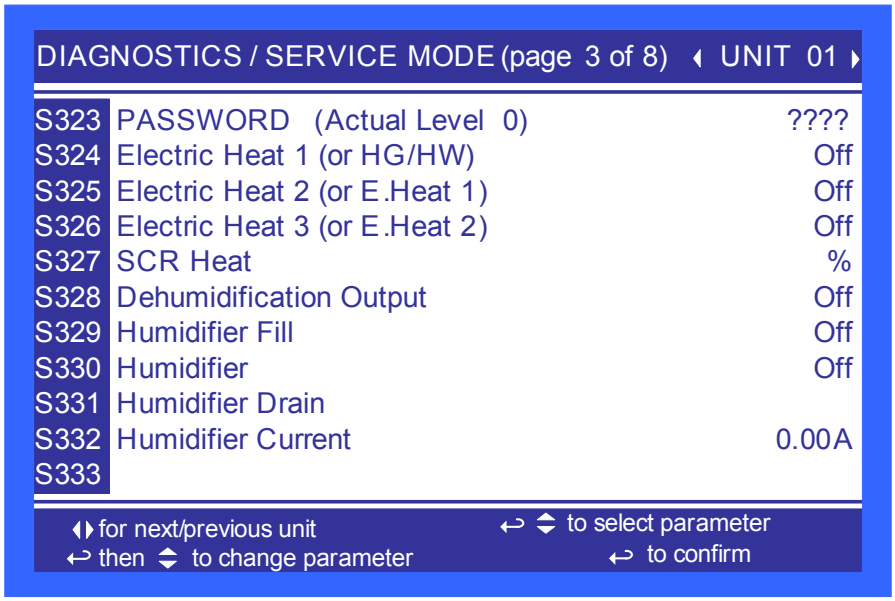
Compressor 2—Turns on Compressor 2 and selects the mode of compressor operation. The choices are RUN, EVACUATE and CHARGE

Compressor 2 Capacity—Enables Compressor 2 Cycle Ramp.

Compressor 2 Cycle Ramp—Selects the capacity the compressor should run at. The range is 0 to 100%.

Compressor 2 LLSV—Controls the liquid line solenoid valve for Compressor 2.

Figure 64 Diagnostics/service mode screen, page 3 of 8


DIAGNOSTICS / SERVICE MODE (page 3 of 8) UNIT 01
S323 PASSWORD (Actual Level 0) ????
S324 Electric Heat 1 (or HG/HW) Off
S325 Electric Heat 2 (or E.Heat 1) Off
S326 Electric Heat 3 (or E.Heat 2) Off
S327 SCR Heat %
S328 Dehumidification Output Off
S329 Humidifier Fill Off
S330 Humidifier Off
S331 Humidifier Drain
S332 Humidifier Current 0.00A
S333
for next/previous unit
then to change parameter
to select parameter
to confirm

Electric Heat 1 (or HG/HW)—Activates Stage 1 of the unit's reheat system.

Electric Heat 2 (or HG/HW)—Activates Stage 2 of the unit's reheat system.

Electric Heat 3 (or HG/HW)—Activates Stage 3 of the unit's reheat system.

SCR Heat—Specifies the pulse width the heating system should run at on units using silicon controlled rectifier type reheat.

Dehumidification Output—Activates the dehumidification cycle.

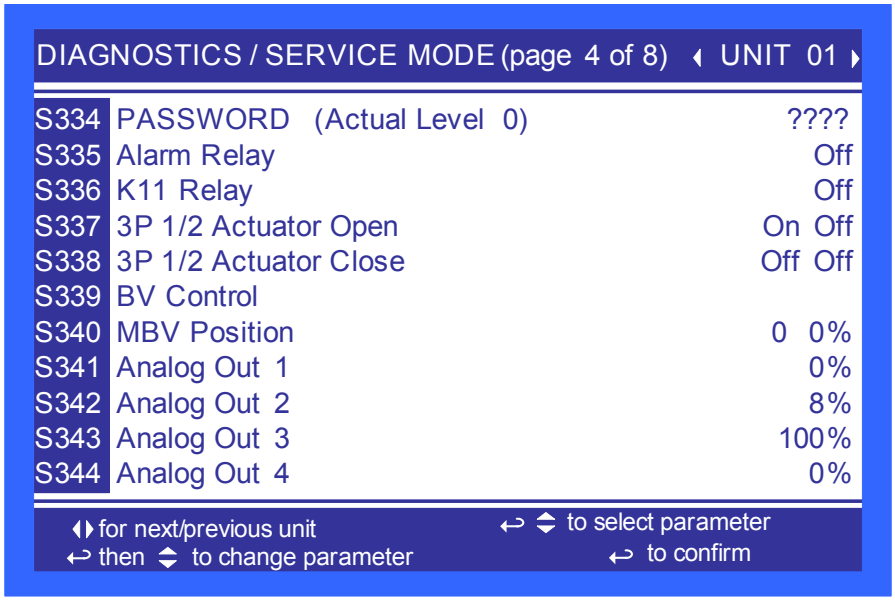
Humidifier Fill—Activates the humidifier water source solenoid valve, which fills the humidifier pan or canister with water.

Humidifier—Activates the humidifier system in its entirety.

Humidifier Drain—Activates the humidifier drain solenoid, allowing water to drain from the canister if the unit is equipped with an optional the steam generating humidifier.

Humidifier Current—Shows the amount of AC amperes the humidifier is consuming if the unit is equipped with an optional the steam generating humidifier.

Figure 65 Diagnostics/service mode screen, page 4 of 8


DIAGNOSTICS / SERVICE MODE (page 4 of 8) UNIT 01
S334 PASSWORD (Actual Level 0) ????
S335 Alarm Relay Off
S336 K11 Relay Off
S337 3P 1/2 Actuator Open On Off
S338 3P 1/2 Actuator Close Off Off
S339 BV Control
S340 MBV Position 0 0%
S341 Analog Out 1 0%
S342 Analog Out 2 8%
S343 Analog Out 3 100%
S344 Analog Out 4 0%
for next/previous unit
then to change parameter
to select parameter
to confirm

Alarm Relay—Activates the Liebert iCOM's common alarm relay output.

K11 Relay—Activates the Liebert iCOM's free-cooling relay output.

3P 1/2 Actuator Open—Energizes the open circuit of the 3P type chilled or free-cooling control valve.

3P 1/2 Actuator Close—Energizes the close circuit of the 3P type chilled or free-cooling control valve.

BV Control—Activates the following two items allowing the motorized ball valve to be manually opened or shut.

MBV1 Position—Specifies the percentage valve 1 should be open. Range is 0 to 100%.

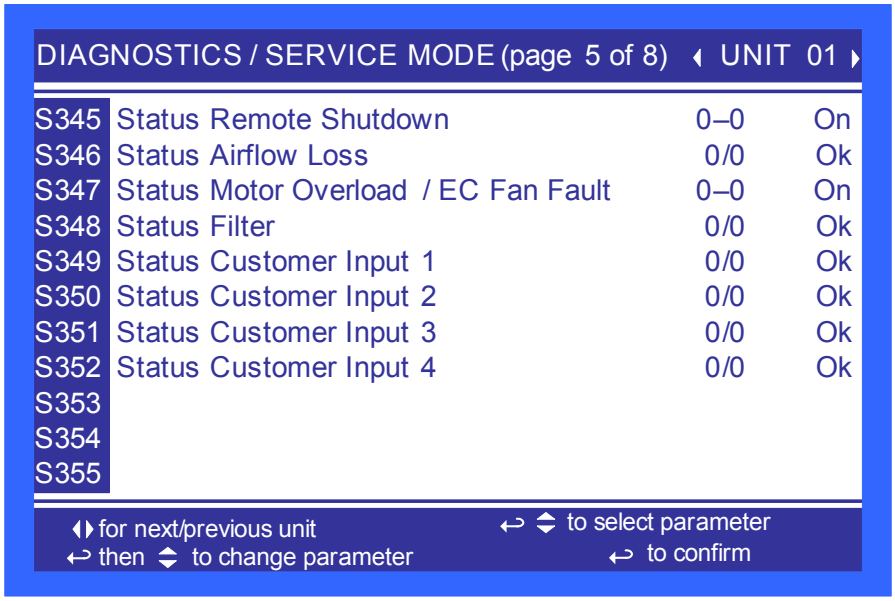
MBV2 Position—Specifies the percentage valve 2 should be open. Range is 0 to 100%.

NOTE

When BV control is set to Auto, the MBV position will be adjusted to the set value, but the pressure control algorithm will immediately begin adjusting the valve to control the condenser pressure. When BV control is set to manual, the MBV position will be maintained as set. Emerson recommends against manually setting the MBVs during compressor operation because it might cause the compressor to trip on its high- or low-pressure protection controls.

Analog Out 1, 2, 3 & 4—Specifies the analog output percentage subsequently controlling the device connected to that output. Range is 0 to 100% but also depends on the output's assignment in factory settings.

Figure 66 Diagnostics/service mode screen, page 5 of 8


DIAGNOSTICS / SERVICE MODE (page 5 of 8) UNIT 01
S345 Status Remote Shutdown 0–0 On
S346 Status Airflow Loss 0/0 Ok
S347 Status Motor Overload / EC Fan Fault 0–0 On
S348 Status Filter 0/0 Ok
S349 Status Customer Input 1 0/0 Ok
S350 Status Customer Input 2 0/0 Ok
S351 Status Customer Input 3 0/0 Ok
S352 Status Customer Input 4 0/0 Ok
S353
S354
S355
for next/previous unit
then to change parameter
to select parameter
to confirm

Status Remote Shutdown—Shows the status of the unit's remote shut down input.

Status Airflow Loss—Shows the status of the unit's air proof switch.

Status Motor Overload / EC Fan Fault—Shows the status of the unit's main fan overload or EC fan fault input.

Status Filter—Shows the status of the unit's filter clog switch input.

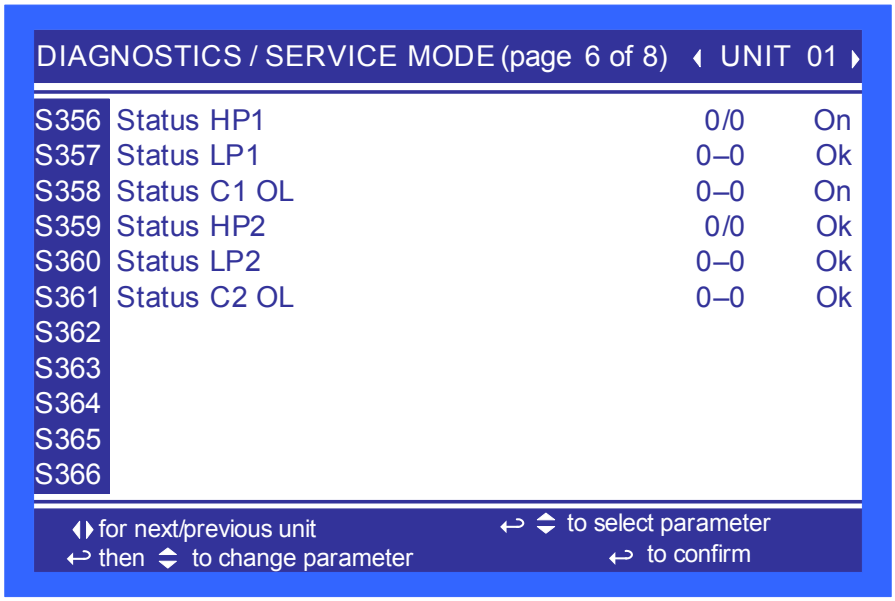
Status Customer Input 1, 2, 3 & 4—Shows the status of the unit's customer inputs.

Status Heaters Safety (Liebert HPM and Liebert PeX only)—Shows the status of the unit's reheat safety switch.

Loss of Airflow at (Liebert HPM only)—Sets the percent of unit airflow to activate the "Loss of Airflow" event on units with optional analog airflow sensor.

Actual Airflow (Liebert HPM only)—Displays the percent of unit airflow from 0-100% on units with optional analog airflow sensor.

Figure 67 Diagnostics/service mode screen, page 6 of 8



Status HP1—Shows the status of the unit's compressor 1 high pressure switch input.

Status LP1—Shows the status of the unit's compressor 1 low pressure switch input.

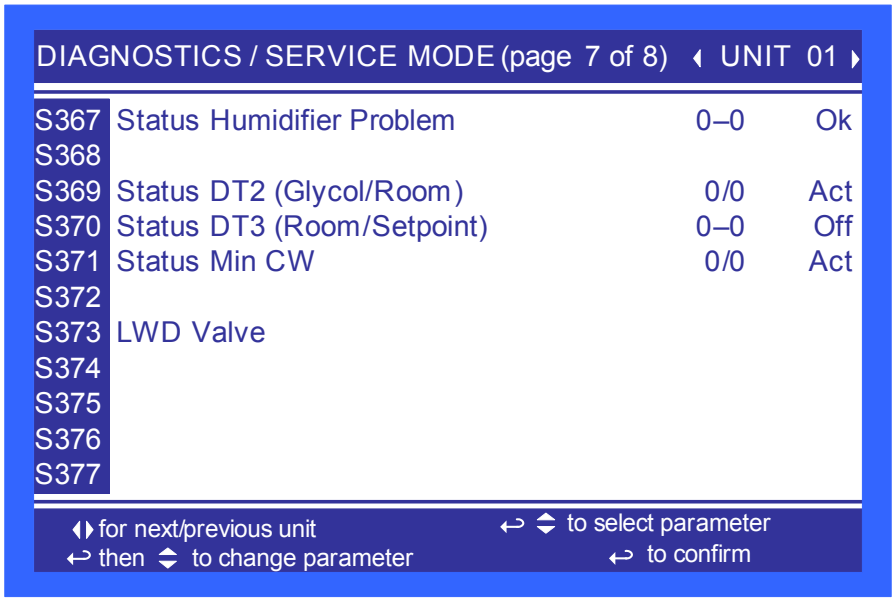
Status C1 OL—Shows the status of the unit's compressor 1 overload input.

Status HP2—Shows the status of the unit's Compressor 2 high pressure switch input.

Status LP2—Shows the status of the unit's Compressor 2 low pressure switch input.

Status C2 OL—Shows the status of the unit's Compressor 2 overload input.

Figure 68 Diagnostics/service mode screen, page 7 of 8



Status Humidifier Problem—Shows the status of the high water level indicator on an infrared humidifier.

Status DT1 (Outdoor/Glycol)—Indicates if the delta T between outdoor air ambient temperature and glycol fluid temperature has been met.

Status DT2 (Glycol/Room)—Indicates if the delta T between glycol and room return air temperature has been met.

Status DT3 (Room/Setpoint)—Indicates if the delta T between room return air temperature and unit air temperature setpoint has been met.

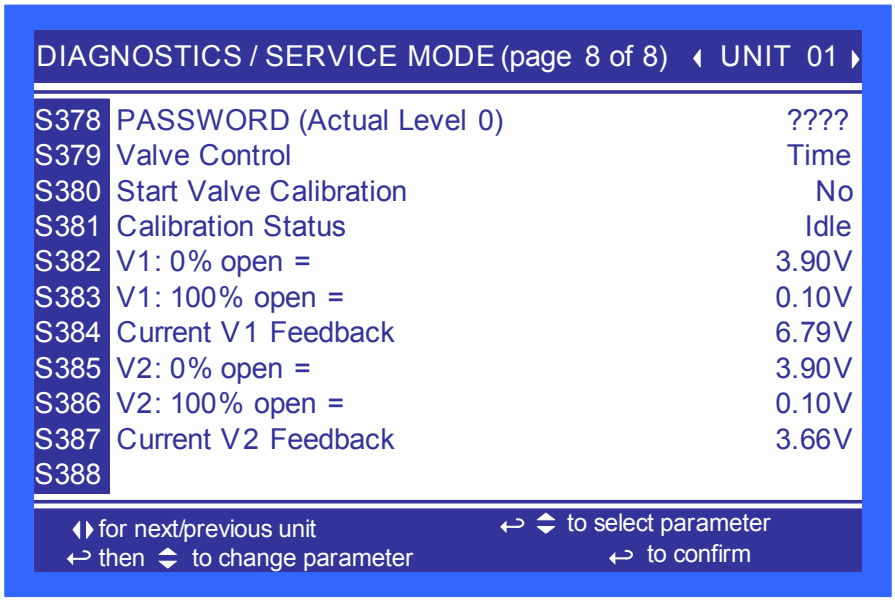
Status Min CW—Indicates if the free-cooling or chilled water temperature is below the minimum chilled water setpoint.

LWD Value (Liebert HPM only)—Displays percent leakage from 0-100% on units with the optional analog Leakage Water Detector.

Status LSI (Liebert HPM and Liebert PeX only)—Shows the status of the high water level indicator on units with variable capacity steam bottle humidifiers.

Status Condenser 2 Failure (Liebert HPM only)—Shows the status of the Condenser 2 failure indicator.

Figure 69 Diagnostics/service mode screen, page 8 of 8


DIAGNOSTICS / SERVICE MODE (page 8 of 8) UNIT 01
S378 PASSWORD (Actual Level 0) ????
S379 Valve Control Time
S380 Start Valve Calibration No
S381 Calibration Status Idle
S382 V1: 0% open = 3.90V
S383 V1: 100% open = 0.10V
S384 Current V1 Feedback 6.79V
S385 V2: 0% open = 3.90V
S386 V2: 100% open = 0.10V
S387 Current V2 Feedback 3.66V
S388
for next/previous unit
then to change parameter
to select parameter
to confirm

Valve Control—Controls the 3P valve(s). Control can be by either of two methods:

- A time-driven signal that uses a 3P valve's travel time and the time that an open or closed output is provided to a 3P valve to estimate its current position.
- A feedback signal from the valve that is required for Supply Air Control. The feedback signal constantly provides the Liebert iCOM with the valve's position, eliminating the need to reset the valve(s) on a loss of power and provides a valve failure detection.

Start Valve Calibration—Changing this value to "Yes" starts the valve calibration procedure. During this procedure the valve is positioned to a fully closed and fully opened state while the feedback signal is monitored. The control then automatically saves the feedback signal voltage at the two end points as its calibration reference during normal operation.

Calibration Status—Shows whether the calibration has been started: **idle** indicates calibration has not begun; **ongoing** indicates calibration has begun. When calibration has been completed the status will return to idle.

V1: 0% open = —Feedback voltage recorded when the valve is positioned at 0% during the calibration.

V1: 100% open = —Feedback voltage recorded when the valve is positioned at 100% during the calibration.

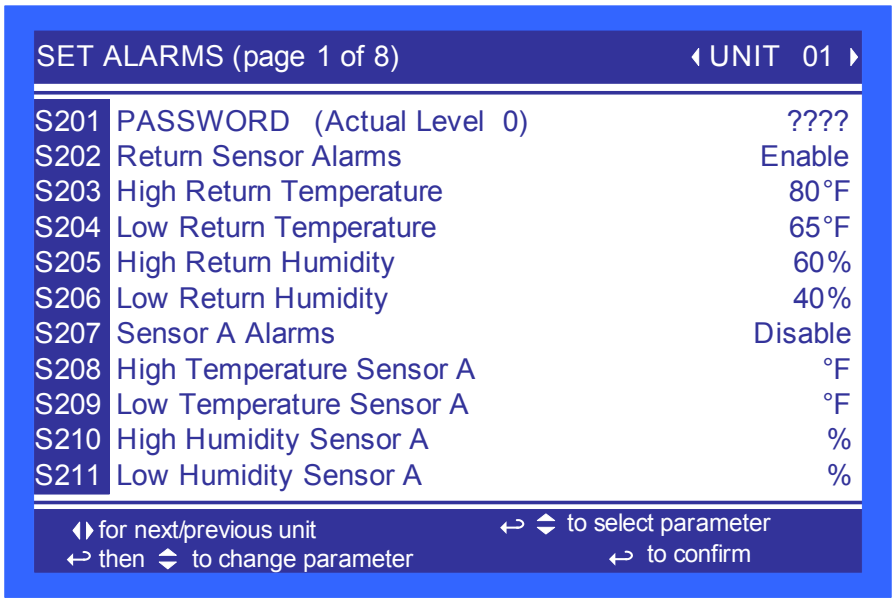
Current V1 Feedback—The valve's current feedback voltage. This value changes as the valve strokes to different open positions.

V2: 0% open = —For an optional secondary valve; operates the same as the V1

V2: 100% open = —For an optional secondary valve; operates the same as the V1.

Current V2 Feedback—For an optional secondary valve; operates the same as the V1.

Figure 70 Set alarms screen, page 1 of 8


SET ALARMS (page 1 of 8)
UNIT 01
S201 PASSWORD (Actual Level 0) ????
S202 Return Sensor Alarms Enable
S203 High Return Temperature 80°F
S204 Low Return Temperature 65°F
S205 High Return Humidity 60%
S206 Low Return Humidity 40%
S207 Sensor A Alarms Disable
S208 High Temperature Sensor A °F
S209 Low Temperature Sensor A °F
S210 High Humidity Sensor A %
S211 Low Humidity Sensor A %
for next/previous unit
then to change parameter
to select parameter
to confirm

Return Sensor Alarms—Enables and disables the return temperature and humidity sensor alarms. Factory default is set to enable.

High Return Temperature—Sets the threshold temperature when a return high temperature alarm will occur.

Low Return Temperature—Sets the threshold temperature when a return low temperature alarm will occur.

High Return Humidity—Sets the threshold humidity when a return high humidity alarm will occur.

Low Return Humidity—Sets the threshold humidity when a return low humidity alarm will occur.

Sensor A Alarms—Enables or disables the alarms associated with Sensor A if the unit is equipped with the optional temperature / humidity sensor.

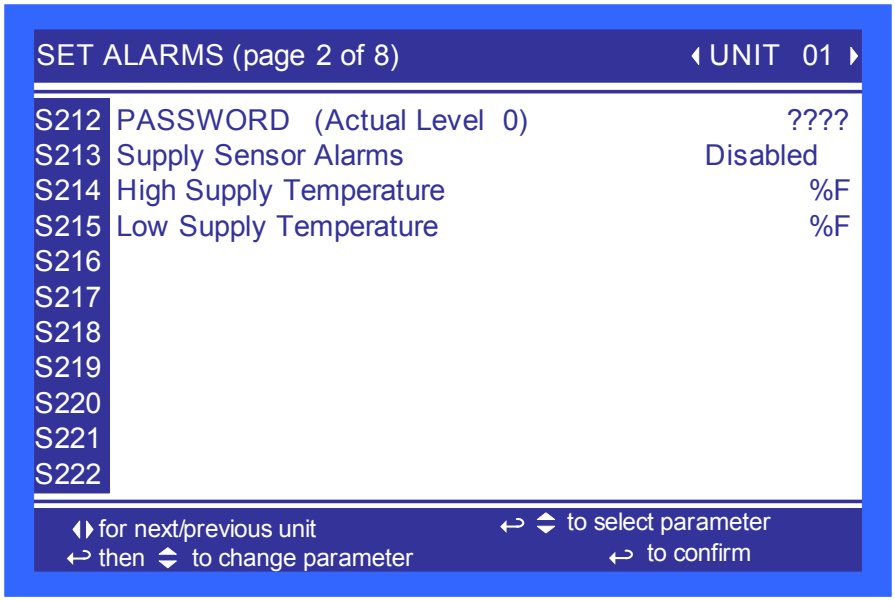
High Temperature Sensor A—Sets the threshold temperature when a Sensor A high temperature alarm will occur.

Low Temperature Sensor A—Sets the threshold temperature when a Sensor A low temperature alarm will occur.

High Humidity Sensor A—Sets the threshold humidity when a Sensor A humidity alarm will occur.

Low Humidity Sensor A—Sets the threshold humidity when a Sensor A low humidity alarm will occur.

Figure 71 Set alarms screen, page 2 of 8

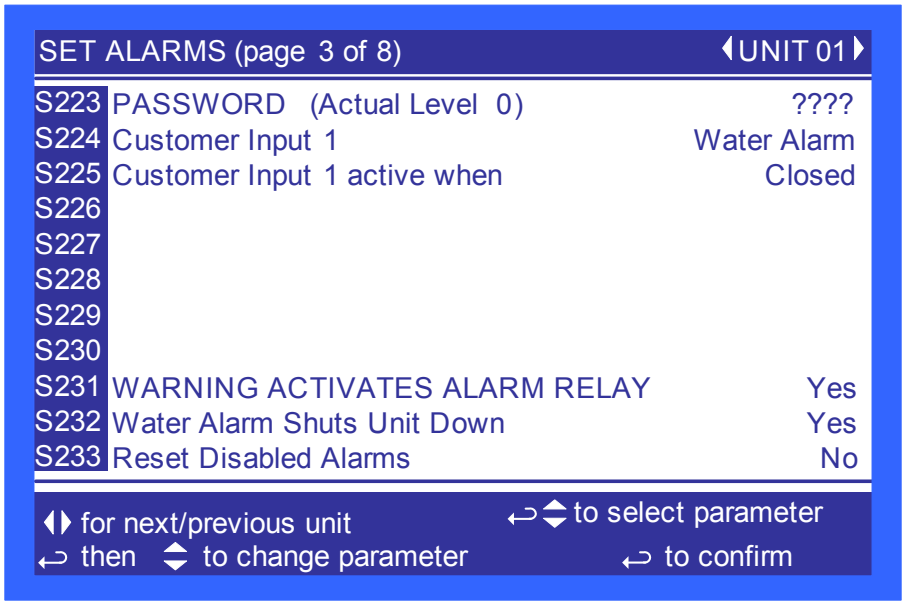


Supply Sensor Alarms—Enables or disables the supply sensor alarms. If the unit is not equipped with a supply temperature sensor then this parameter will show **Disabled**.

High Supply Temperature—Sets the high supply temperature threshold that will trigger a **High Supply Temperature** alarm.

Low Supply Temperature—Sets the low supply temperature threshold that will trigger a **Low Supply Temperature** alarm.

Figure 72 Set alarms screen, page 3 of 8



Customer Input 1, 2, 3 & 4—Select the device and operation of the customer inputs. Each event reflects a different alarm and possible action to the unit. Refer to **Table 7** for a description of selectable options.

Customer Input 1, 2, 3 & 4 active when—Select whether the input is a normally closed or normally closed input.

WARNING ACTIVATES ALARM RELAY—Sets the alarm relay (K3) to activate when a warning occurs.

Water Alarm Shuts Unit Down—Turn the unit Off if a water alarm occurs.

Set Alarm Screens, Pages 4-8

The Set Alarm Screens, pages 4 through 8 (**Figures 73** through **77**) permit setting the operation of an active alarm. Each event can be enabled or disabled and can be set to operate as an alarm, warning or message. The delay is the time the control waits before reporting the event.

Alarm: Annunciates the buzzer, triggers a monitoring event, triggers the alarm relay and flashes the red LED on the display

Warning: Annunciates the buzzer, triggers a monitoring event, shows the event in the event viewer / front display and flashes the red LED on the display.

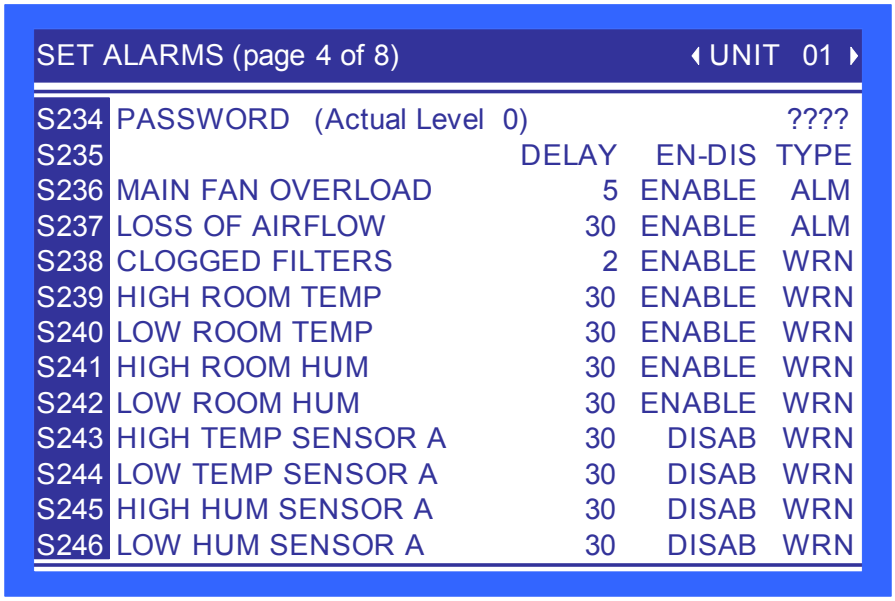
Message: Shows the event in the event viewer and on the front display.

Delay—The delay selection for each alarm.

EN-DIS—The enable / disable selection for each alarm provides the ability to individually select the alarms that will or will not activate when the alarm condition occurs.

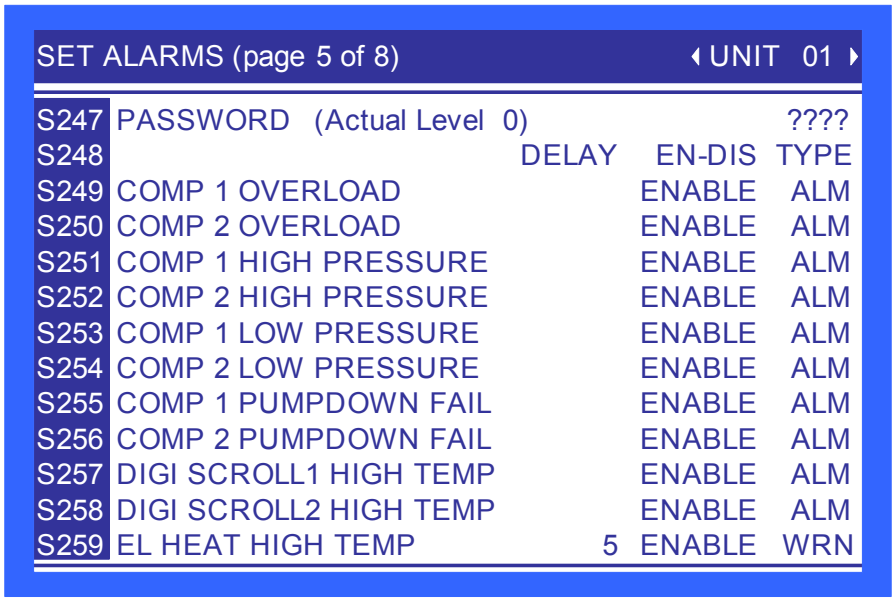
Type—Sets the type of action for each event listed. There are three different types of events: Alarm, Warning and Message. When an event is triggered and the type is set to “Alarm,” then the light and buzzer on the display will activate, an event will be written to the event log and the (K3) alarm relay will close. If the type is set to “Warning,” then the light and buzzer on the display will activate, an event will be written to the event log and the (K3) alarm relay can be configured to close or provide no reaction. If the type is set to “Message,” then the event is only written to the event log.

Figure 73 Set alarms screen, page 4 of 8



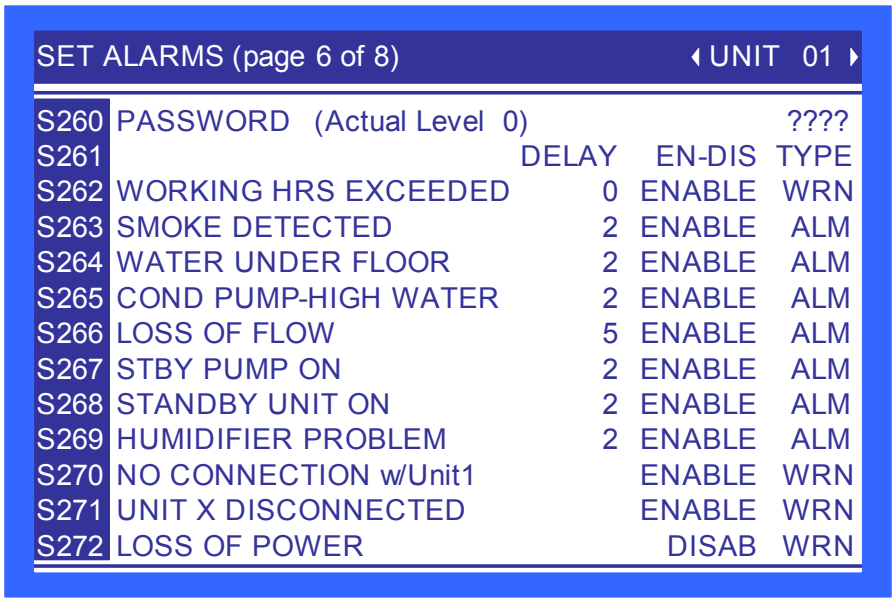
SET ALARMS (page 4 of 8)			UNIT 01
S234	PASSWORD (Actual Level 0)		????
S235		DELAY EN-DIS	TYPE
S236	MAIN FAN OVERLOAD	5 ENABLE	ALM
S237	LOSS OF AIRFLOW	30 ENABLE	ALM
S238	CLOGGED FILTERS	2 ENABLE	WRN
S239	HIGH ROOM TEMP	30 ENABLE	WRN
S240	LOW ROOM TEMP	30 ENABLE	WRN
S241	HIGH ROOM HUM	30 ENABLE	WRN
S242	LOW ROOM HUM	30 ENABLE	WRN
S243	HIGH TEMP SENSOR A	30 DISAB	WRN
S244	LOW TEMP SENSOR A	30 DISAB	WRN
S245	HIGH HUM SENSOR A	30 DISAB	WRN
S246	LOW HUM SENSOR A	30 DISAB	WRN

Figure 74 Set alarms screen, page 5 of 8



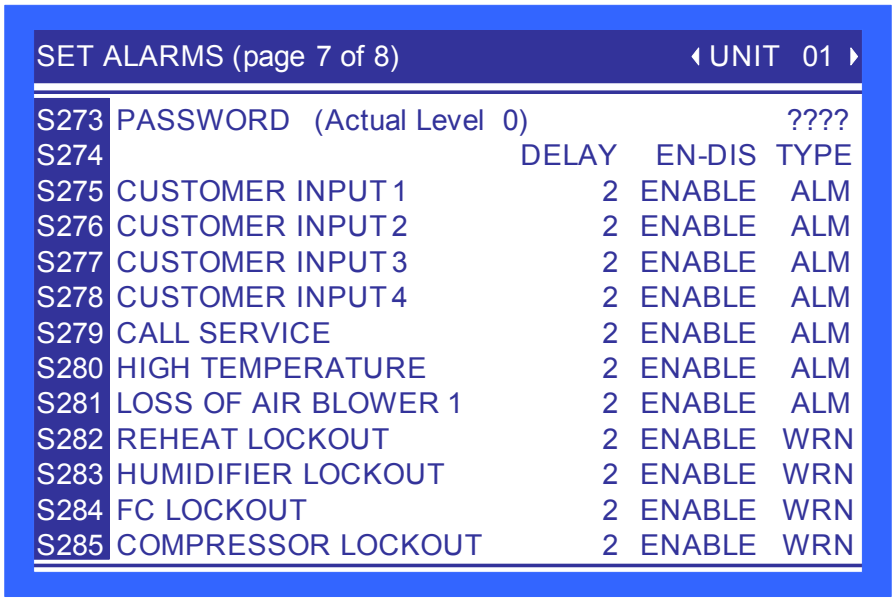
SET ALARMS (page 5 of 8)			UNIT 01
S247	PASSWORD (Actual Level 0)		????
S248		DELAY EN-DIS	TYPE
S249	COMP 1 OVERLOAD	ENABLE	ALM
S250	COMP 2 OVERLOAD	ENABLE	ALM
S251	COMP 1 HIGH PRESSURE	ENABLE	ALM
S252	COMP 2 HIGH PRESSURE	ENABLE	ALM
S253	COMP 1 LOW PRESSURE	ENABLE	ALM
S254	COMP 2 LOW PRESSURE	ENABLE	ALM
S255	COMP 1 PUMPDOWN FAIL	ENABLE	ALM
S256	COMP 2 PUMPDOWN FAIL	ENABLE	ALM
S257	DIGI SCROLL1 HIGH TEMP	ENABLE	ALM
S258	DIGI SCROLL2 HIGH TEMP	ENABLE	ALM
S259	EL HEAT HIGH TEMP	5 ENABLE	WRN

Figure 75 Set alarms screen, page 6 of 8



SET ALARMS (page 6 of 8)			◂ UNIT 01 ▸
S260	PASSWORD (Actual Level 0)		????
S261		DELAY EN-DIS	TYPE
S262	WORKING HRS EXCEEDED	0 ENABLE	WRN
S263	SMOKE DETECTED	2 ENABLE	ALM
S264	WATER UNDER FLOOR	2 ENABLE	ALM
S265	COND PUMP-HIGH WATER	2 ENABLE	ALM
S266	LOSS OF FLOW	5 ENABLE	ALM
S267	STBY PUMP ON	2 ENABLE	ALM
S268	STANDBY UNIT ON	2 ENABLE	ALM
S269	HUMIDIFIER PROBLEM	2 ENABLE	ALM
S270	NO CONNECTION w/Unit1	ENABLE	WRN
S271	UNIT X DISCONNECTED	ENABLE	WRN
S272	LOSS OF POWER	DISAB	WRN

Figure 76 Set alarms screen, page 7 of 8



SET ALARMS (page 7 of 8)			◂ UNIT 01 ▸
S273	PASSWORD (Actual Level 0)		????
S274		DELAY EN-DIS	TYPE
S275	CUSTOMER INPUT 1	2 ENABLE	ALM
S276	CUSTOMER INPUT 2	2 ENABLE	ALM
S277	CUSTOMER INPUT 3	2 ENABLE	ALM
S278	CUSTOMER INPUT 4	2 ENABLE	ALM
S279	CALL SERVICE	2 ENABLE	ALM
S280	HIGH TEMPERATURE	2 ENABLE	ALM
S281	LOSS OF AIR BLOWER 1	2 ENABLE	ALM
S282	REHEAT LOCKOUT	2 ENABLE	WRN
S283	HUMIDIFIER LOCKOUT	2 ENABLE	WRN
S284	FC LOCKOUT	2 ENABLE	WRN
S285	COMPRESSOR LOCKOUT	2 ENABLE	WRN

Figure 77 Set alarms screen, page 8 of 8

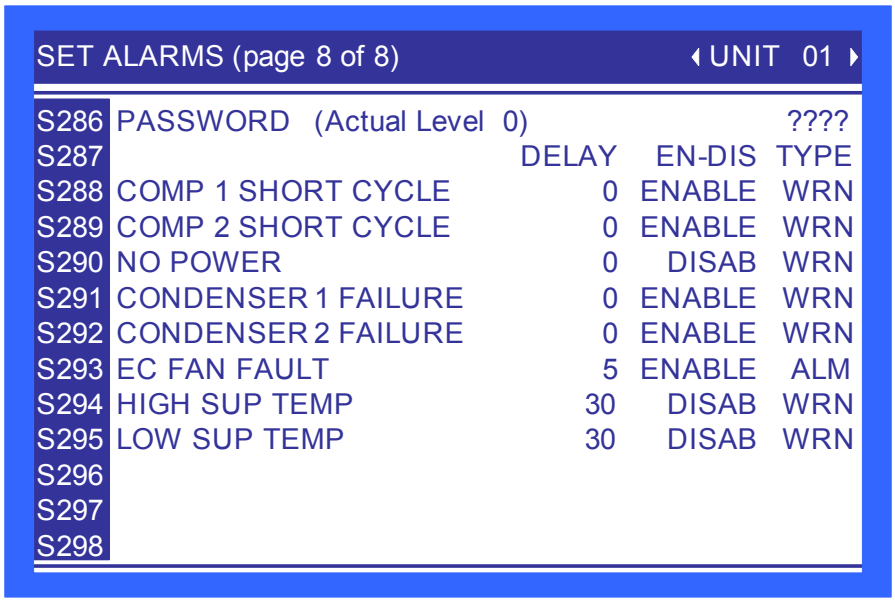
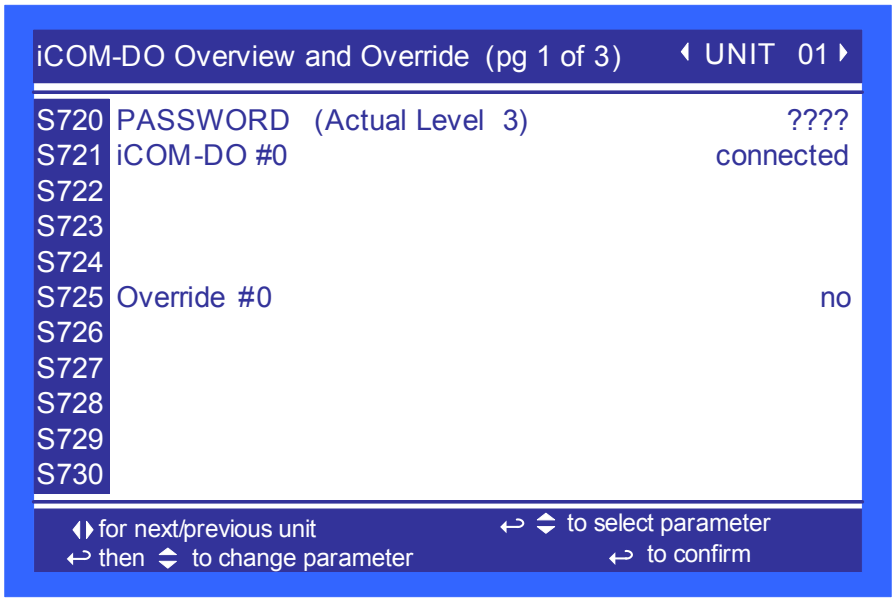

SET ALARMS (page 8 of 8)
UNIT 01
S286 PASSWORD (Actual Level 0) ????
S287 DELAY EN-DIS TYPE
S288 COMP 1 SHORT CYCLE 0 ENABLE WRN
S289 COMP 2 SHORT CYCLE 0 ENABLE WRN
S290 NO POWER 0 DISAB WRN
S291 CONDENSER 1 FAILURE 0 ENABLE WRN
S292 CONDENSER 2 FAILURE 0 ENABLE WRN
S293 EC FAN FAULT 5 ENABLE ALM
S294 HIGH SUP TEMP 30 DISAB WRN
S295 LOW SUP TEMP 30 DISAB WRN
S296
S297
S298

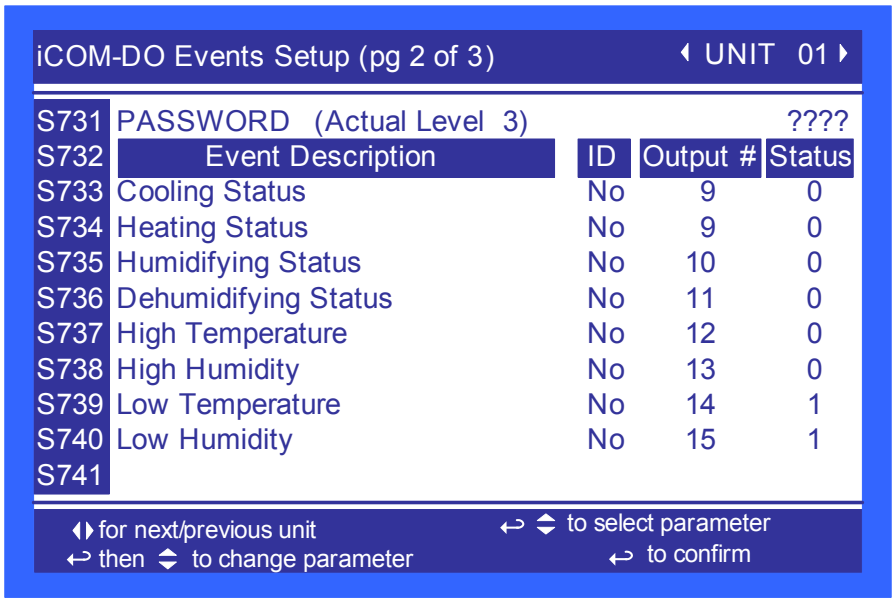
Figure 78 iCOM-DO overview and override screen, page 1 of 3



Liebert iCOM-DO—Shows the connection status of a Liebert iCOM-DO card. It displays "connected" when a Liebert iCOM-DO card has been set up and connected to the Liebert iCOM via the CAN bus.

Override—Permits manual testing the Liebert iCOM-DO by activating each output on the following screen.

Figure 79 iCOM-DO events setup screen, page 2 of 3


iCOM-DO Events Setup (pg 2 of 3)
UNIT 01
S731 PASSWORD (Actual Level 3) ????
S732 Event Description ID Output # Status
S733 Cooling Status No 9 0
S734 Heating Status No 9 0
S735 Humidifying Status No 10 0
S736 Dehumidifying Status No 11 0
S737 High Temperature No 12 0
S738 High Humidity No 13 0
S739 Low Temperature No 14 1
S740 Low Humidity No 15 1
S741
for next/previous unit
then to change parameter
to select parameter
to confirm

Status—Shows whether an output is in a normally closed or normally open state.

Output #—Shows which output is tied to a particular alarm. The default values are set to be the same output as the Liebert ENV-DO card, the predecessor to the Liebert iCOM-DO.

ID—Displays the number of the Liebert iCOM-DO. Currently only one Liebert iCOM-DO card is supported.

Figure 80 iCOM-DO events setup screen, page 3 of 3

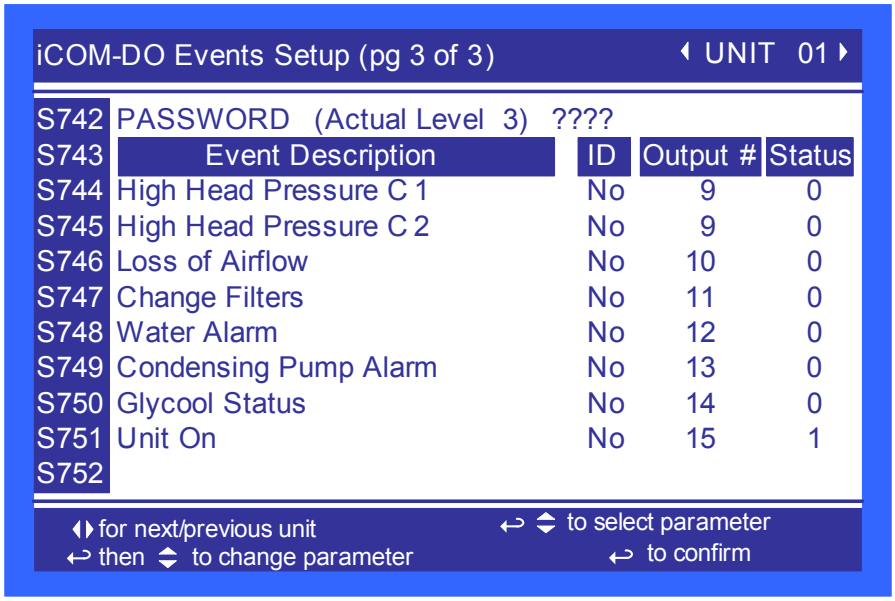
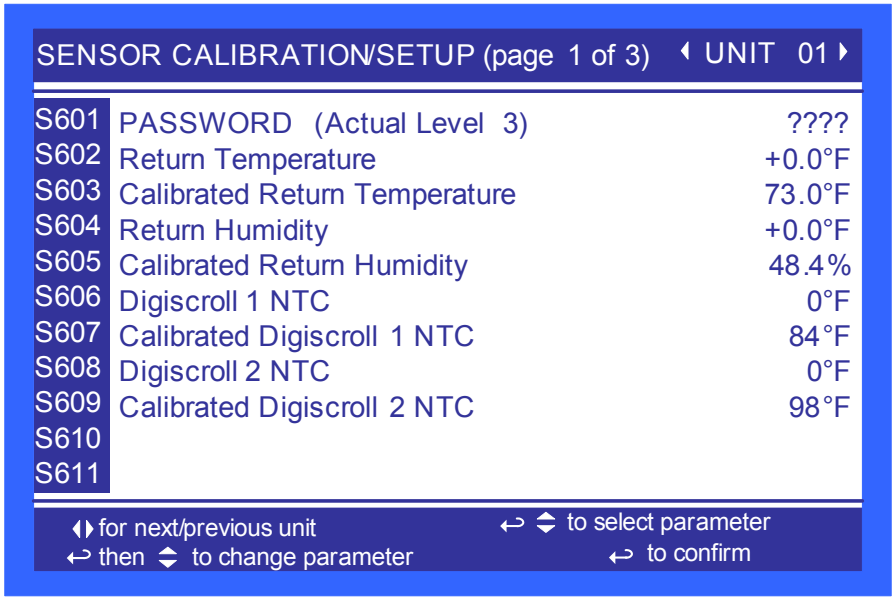

iCOM-DO Events Setup (pg 3 of 3)
UNIT 01
S742 PASSWORD (Actual Level 3) ????
S743 Event Description ID Output # Status
S744 High Head Pressure C 1 No 9 0
S745 High Head Pressure C 2 No 9 0
S746 Loss of Airflow No 10 0
S747 Change Filters No 11 0
S748 Water Alarm No 12 0
S749 Condensing Pump Alarm No 13 0
S750 Glycool Status No 14 0
S751 Unit On No 15 1
S752
for next/previous unit
then to change parameter
to select parameter
to confirm

Figure 81 Sensor calibration setup screen, page 1 of 3


SENSOR CALIBRATION/SETUP (page 1 of 3)
UNIT 01
S601 PASSWORD (Actual Level 3) ????
S602 Return Temperature +0.0°F
S603 Calibrated Return Temperature 73.0°F
S604 Return Humidity +0.0°F
S605 Calibrated Return Humidity 48.4%
S606 Digiscroll 1 NTC 0°F
S607 Calibrated Digiscroll 1 NTC 84°F
S608 Digiscroll 2 NTC 0°F
S609 Calibrated Digiscroll 2 NTC 98°F
S610
S611
for next/previous unit
then to change parameter
to select parameter
to confirm

Return Temperature—Adjusts the return temperature reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

Calibrated Return Temperature—Shows the adjusted temperature value of the return sensor. This value is the actual sensor reading (+ or -) the offset "Return Temperature".

Return Humidity—Adjusts the return humidity reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

Calibrated Return Humidity—Shows the adjusted humidity value of the return sensor. This value is the actual sensor reading (+ or -) the offset "Return Humidity".

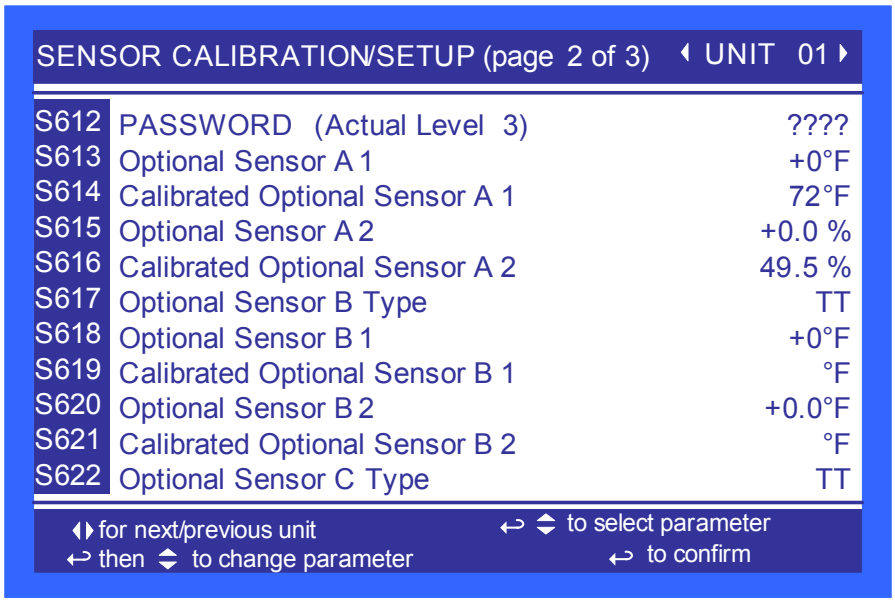
Digital Scroll 1 NTC—Adjusts the digital scroll 1 NTC reading from the actual sensor to compensate for any error or drift of the sensor.

Calibrated Digital Scroll 1 NTC—Shows the adjusted Digital Scroll 1 NTC sensor value. This value is the actual sensor reading (+ or -) the offset "Digital Scroll 1 NTC".

Digital Scroll 2 NTC—Adjusts the digital scroll 1 NTC reading from the actual sensor to compensate for any error or drift of the sensor.

Calibrated Digital Scroll 2 NTC—Shows the adjusted Digital Scroll 1 NTC sensor value. This value is the actual sensor reading (+ or -) the offset "Digital Scroll 1 NTC."

Figure 82 Sensor calibration/setup screen, page 2 of 3

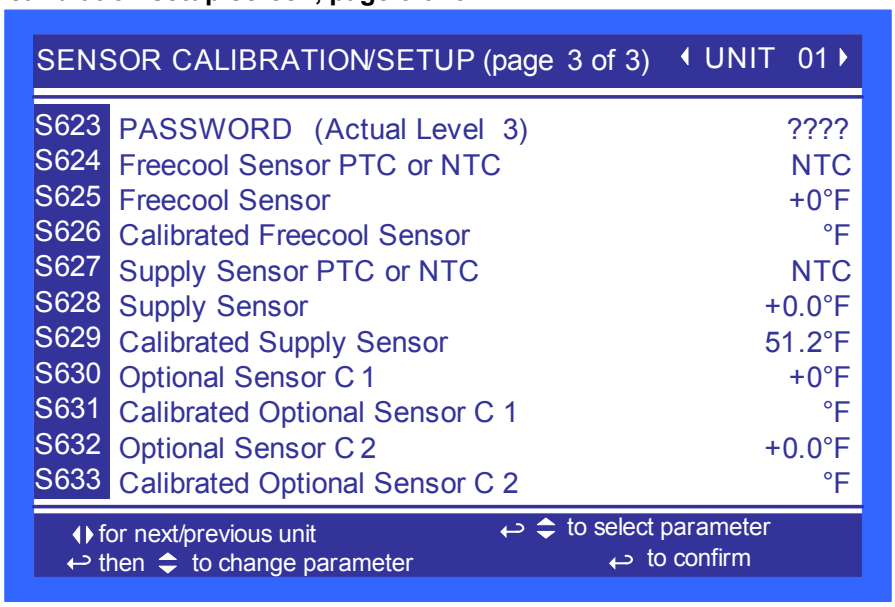

SENSOR CALIBRATION/SETUP (page 2 of 3) UNIT 01
S612 PASSWORD (Actual Level 3) ????
S613 Optional Sensor A 1 +0°F
S614 Calibrated Optional Sensor A 1 72°F
S615 Optional Sensor A 2 +0.0 %
S616 Calibrated Optional Sensor A 2 49.5 %
S617 Optional Sensor B Type TT
S618 Optional Sensor B 1 +0°F
S619 Calibrated Optional Sensor B 1 °F
S620 Optional Sensor B 2 +0.0°F
S621 Calibrated Optional Sensor B 2 °F
S622 Optional Sensor C Type TT
for next/previous unit
then to change parameter
to select parameter
to confirm

Optional Sensor A, B and C—Adjusts the reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

Calibrated Optional Sensor A, B and C—Shows the adjusted value of the sensor. This value is the actual sensor reading (+ or -) the offset.

Optional Sensor B and C Type—Currently supports only the "TH" Temperature/Humidity sensor type.

Figure 83 Sensor calibration/setup screen, page 3 of 3


SENSOR CALIBRATION/SETUP (page 3 of 3) UNIT 01
S623 PASSWORD (Actual Level 3) ????
S624 Freecool Sensor PTC or NTC NTC
S625 Freecool Sensor +0°F
S626 Calibrated Freecool Sensor °F
S627 Supply Sensor PTC or NTC NTC
S628 Supply Sensor +0.0°F
S629 Calibrated Supply Sensor 51.2°F
S630 Optional Sensor C 1 +0°F
S631 Calibrated Optional Sensor C 1 °F
S632 Optional Sensor C 2 +0.0°F
S633 Calibrated Optional Sensor C 2 °F
for next/previous unit
then to change parameter
to select parameter
to confirm

Freecool Sensor PTC or NTC—Currently supports only the NTC selection.

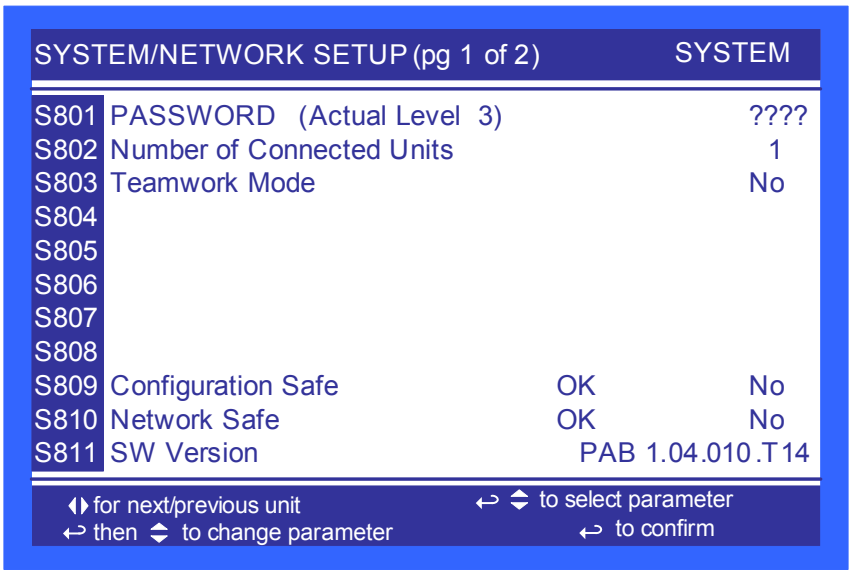
Freecool Sensor—Adjusts the free-cooling temperature reading from the actual sensor to compensate for any sensor error or to match other sensors in the room.

Calibrated Freecool Sensor—Shows the adjusted temperature value of the free-cooling sensor. This value is the actual sensor reading (+ or -) the offset "Freecool Sensor".

Supply Sensor—Adjusts the supply temperature reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

Calibrated Supply Sensor—Shows the adjusted temperature value of the supply sensor. This value is the actual sensor reading (+ or -) the offset "Supply Sensor".

Figure 84 System/network setup screen—System, page 1 of 2 (large display only)



Number of Connected Units—Sets the number of units that will be viewable from the large display and will participate on the unit to unit network.

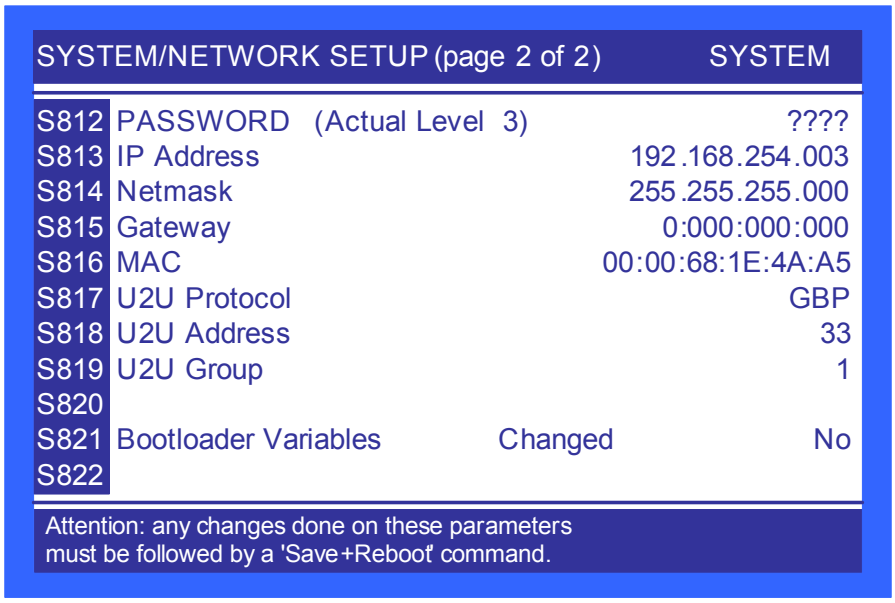
Teamwork Mode—Selects which teamwork mode to use within a selected group. Teamwork modes are described in section 4.0 of this manual.

Configuration Safe—Saves or loads configuration settings for the display that have been modified from the factory defaults to an internal file that can be downloaded / uploaded using the Liebert iCOM Service Tool. Selecting "Save" will write the settings to the internal storage file and selecting "Load" will write the settings from the internal storage file to the application software. The internal file is updated every 12 hours automatically.

Network Safe—Saves or loads network settings for the display that have been modified from the factory defaults to an internal file that can be downloaded/uploaded using the Liebert iCOM Service Tool. Selecting "Save" will write the settings to the internal storage file. Selecting "Load" will write the settings from the internal storage file to the application software.

SW Version—Contains the application software version loaded onto the Liebert iCOM display.

Figure 85 System/network setup screen—System, page 2 of 2 (large display only)


SYSTEM/NETWORK SETUP (page 2 of 2) SYSTEM
S812 PASSWORD (Actual Level 3) ????
S813 IP Address 192.168.254.003
S814 Netmask 255.255.255.000
S815 Gateway 0:000:000:000
S816 MAC 00:00:68:1E:4A:A5
S817 U2U Protocol GBP
S818 U2U Address 33
S819 U2U Group 1
S820
S821 Bootloader Variables Changed No
S822
Attention: any changes done on these parameters
must be followed by a 'Save+Reboot' command.

IP Address—Contains the network address of the display. This address must be unique on the network.

Netmask—Not currently used.

Gateway—Not currently used.

MAC—Unique hardware identifier of the Ethernet device.

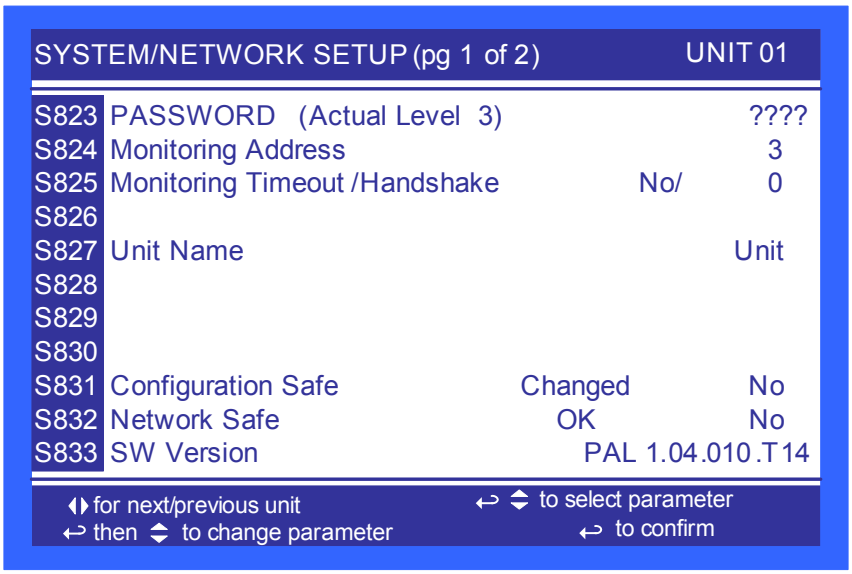
U2U Protocol—Always set to GBP.

U2U Address—Unique identifier for each unit on the network. Display addresses range from 33 to 64. Each display on the U2U network must have a different U2U address.

U2U Group—Used to create zones or groups within a U2U network. Once a group number is selected the display will see only devices with the same group number. The group number can be changed to view other devices in different groups.

Bootloader Variables—Indicates if there has been a change to the bootloader since it was last loaded. This parameter should only be activated by an authorized service person.

Figure 86 System/network setup screen—Unit, page 1 of 2



Monitoring Address—Sets the address used by the Liebert Intellislot® cards. This is set to 3 at the factory and should not be changed.

Monitoring Timeout / Handshake—Used with a building management system to verify communication between the Liebert iCOM and the BMS has not been lost. If the amount of time specified in this parameter elapses before the BMS writes a new value, then an alarm will occur "BMS TIMEOUT" and the temperature setpoint will revert to the backup setpoint and the fan speed "if equipped" will change to 100%. To disable this feature, write a zero to this parameter when it is active.

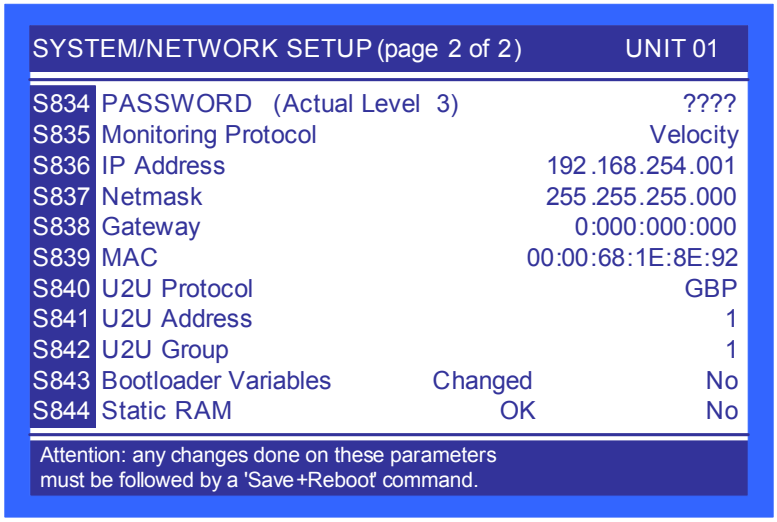
Unit Name—A label to identify the unit from the local or remote display. This label will show at the top right of every screen that has monitoring or configuration of that unit.

Configuration Safe—Saves or loads configuration settings for the control board that have been modified from the factory defaults to an internal file that can be downloaded / uploaded using the Liebert iCOM Service Tool. Selecting "Save" will write the settings to the internal storage file and selecting "Load" will write the settings from the internal storage file to the application software. The internal file is updated every 12 hours automatically.

Network Safe—Saves or loads network settings for the control board that have been modified from the factory defaults to an internal file that can be downloaded / uploaded using the Liebert iCOM Service Tool. Selecting "Save" will write the settings to the internal storage file and selecting "Load" will write the settings from the internal storage file to the application software.

SW Version—Contains the application software version loaded onto the Liebert iCOM control board.

Figure 87 System/network setup screen—Unit, page 2 of 2


SYSTEM/NETWORK SETUP (page 2 of 2) UNIT 01
S834 PASSWORD (Actual Level 3) ????
S835 Monitoring Protocol Velocity
S836 IP Address 192.168.254.001
S837 Netmask 255.255.255.000
S838 Gateway 0:000:000:000
S839 MAC 00:00:68:1E:8E:92
S840 U2U Protocol GBP
S841 U2U Address 1
S842 U2U Group 1
S843 Bootloader Variables Changed No
S844 Static RAM OK No
Attention: any changes done on these parameters
must be followed by a 'Save+Reboot' command.

Monitoring Protocol—Selects the monitoring protocol. Velocity V4 is the factory default that will provide communication to the Liebert IntelliSlot housing. IGMNet will activate the 77/78 terminals for communication to the Liebert SiteLink(-E). Liebert Hironet is only used on Liebert HPM units.

IP Address—Contains the network address of the display. This address must be unique on the network.

Netmask—Not currently used.

Gateway—Not currently used.

MAC—Unique hardware identifier of the Ethernet device.

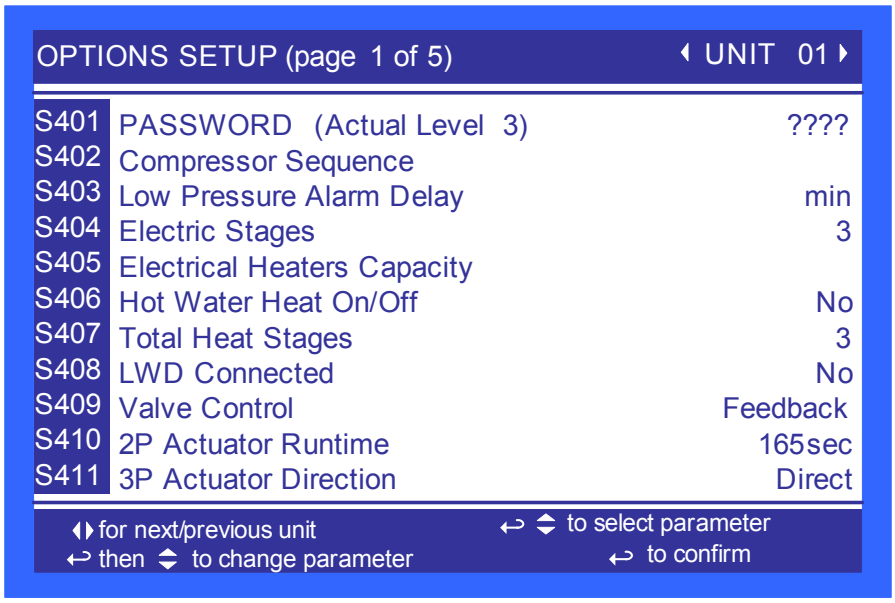
U2U Protocol—This parameter is always set to GBP.

U2U Address—Unique identifier for each unit on the network. Display addresses range from 33 to 64. Each display on the U2U network must have a different U2U address.

U2U Group—Creates zones or groups within a U2U network. Once a group number is selected, the display will see only devices with the same group number. The group number can be changed to view other devices in different groups.

Bootloader Variables—Indicates if there has been a change to the boot loader since it was last loaded. This parameter should only be activated by an authorized service person.

Figure 88 Options setup, page 1 of 5


OPTIONS SETUP (page 1 of 5)
UNIT 01
S401 PASSWORD (Actual Level 3) ????
S402 Compressor Sequence
S403 Low Pressure Alarm Delay min
S404 Electric Stages 3
S405 Electrical Heaters Capacity
S406 Hot Water Heat On/Off No
S407 Total Heat Stages 3
S408 LWD Connected No
S409 Valve Control Feedback
S410 2P Actuator Runtime 165sec
S411 3P Actuator Direction Direct
for next/previous unit
then to change parameter
to select parameter
to confirm

Compressor Sequence—Changes the lead compressor when cooling is activated. This parameter can also be set to "AUTO" mode, which will activate the compressor with the lowest run hours first.

Low Pressure Alarm Delay—Sets how long the unit will ignore a low-pressure condition during compressor startup. This parameter has previously been referred to as a Winter Start Time. This parameter can be set between 0 to 5 minutes.

Electric Stages—Shows the number of electric stages that can be activated during a call for reheat. This parameter is set at the factory based on the unit's model number.

Electrical Heater Capacity (Liebert HPM only)—Shows the electrical heater capacity for units with both electric and hot water or hot gas reheat. Reduced capacity indicates HW/HG Stage 1, electric Stage 2; full capacity indicates HW/HG plus low capacity electric Stage 1, high capacity electric Stage 2.

Hot Water Heat On/Off—This parameter is selectable between "Yes and No". If "Yes" is selected the unit is equipped with a hot water heater.

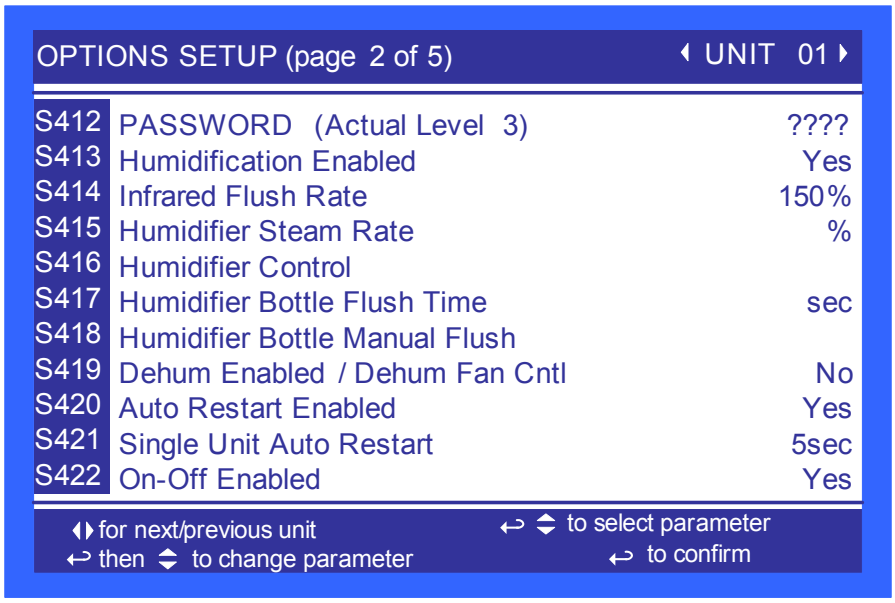
LWD Connected—This parameter is set to "Yes" if a liquid detection device is connected to the Liebert iCOM.

Valve Control—Selects between two different methods to keep track of valve position when a stem/3P valve is installed in the unit. This setting does not affect motorized ball valves. If "Time" is selected then the valve position is tracked by an internal timer in the control to determine the position or opening of the valve. If "Feedback" is selected then analog input #1 interprets the signal from the valve to determine its position. Using the "Feedback" setting requires the setup procedure in **3.2.3 - Chilled Water Control**.

3P Actuator Runtime—Sets the travel time of the valve to determine the full open and closed position of the valve. This is set at the factory based on the valve manufacturer's specifications.

3P Actuator Direction—Selects if the valve is a "Direct" or "Reverse" acting valve.

Figure 89 Options setup, page 2 of 5


OPTIONS SETUP (page 2 of 5)
UNIT 01
S412 PASSWORD (Actual Level 3) ????
S413 Humidification Enabled Yes
S414 Infrared Flush Rate 150%
S415 Humidifier Steam Rate %
S416 Humidifier Control
S417 Humidifier Bottle Flush Time sec
S418 Humidifier Bottle Manual Flush
S419 Dehum Enabled / Dehum Fan Cntl No
S420 Auto Restart Enabled Yes
S421 Single Unit Auto Restart 5sec
S422 On-Off Enabled Yes
for next/previous unit
then to change parameter
to select parameter
to confirm

Humidification Enabled—Enables or disables humidification.

Infrared Flush Rate—Shows the amount of makeup water supplied to an infrared humidifier as a percentage of the humidifier capacity. This value can be set from 110-500% (default is 150%). Higher flush rates reduce mineral deposit buildup in the humidifier pan.

Humidifier Steam Rate (Liebert HPM and Liebert PeX only)—Reduces humidifier capacity to be a percentage of nominal humidifier capacity on units with variable capacity steam bottle humidifiers.

Humidifier Control—Used for Liebert HPM and Liebert PeX units only.

Humidifier Bottle Flush Time—Used for Liebert HPM and Liebert PeX units only.

Humidifier Bottle Manual Flush—Used for Liebert HPM and Liebert PeX units only.

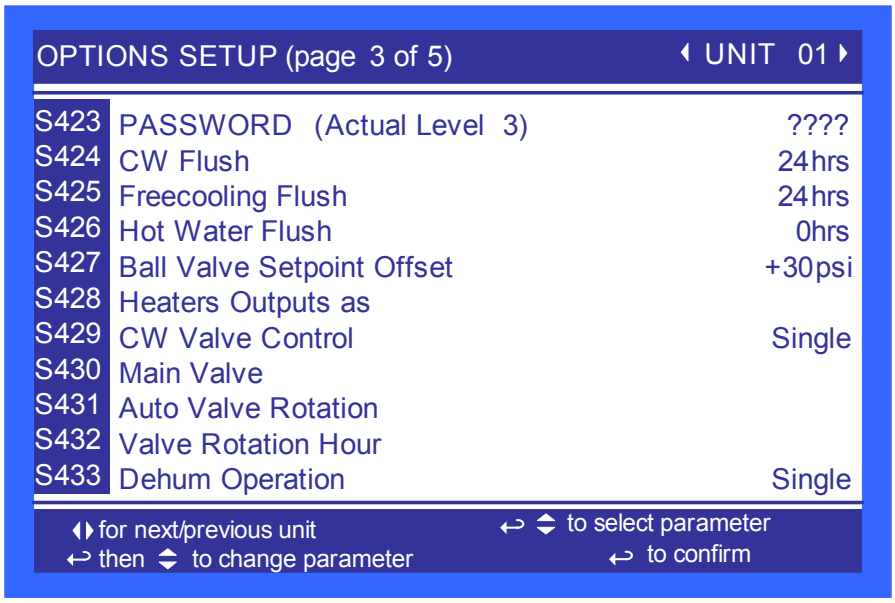
Dehumidification Enabled—Selects whether the compressor and / or valve will be used to dehumidify when the humidity is above setpoint.

Auto Restart Enabled—Restarts the unit after a power cycle when set to "Yes." When this parameter is set to "No," the unit will not restart (Turn On) after a power cycle.

Single Unit Auto Restart—Sets a time delay for the unit to restart when the Auto Restart Enabled is set to "Yes". The delay begins once the boot process has completed. This parameter allows units to be staggered On to reduce the amount of simultaneous power consumption after a loss of power.

On-Off Enabled—Disables the power button on the front of the display. The default configuration is "On".

Figure 90 Options setup, page 3 of 5


OPTIONS SETUP (page 3 of 5)
UNIT 01
S423 PASSWORD (Actual Level 3) ????
S424 CW Flush 24hrs
S425 Freecooling Flush 24hrs
S426 Hot Water Flush 0hrs
S427 Ball Valve Setpoint Offset +30psi
S428 Heaters Outputs as
S429 CW Valve Control Single
S430 Main Valve
S431 Auto Valve Rotation
S432 Valve Rotation Hour
S433 Dehum Operation Single
for next/previous unit
then to change parameter
to select parameter
to confirm

CW Flush—Selects the number of hours between each chill water coil flush cycle. The default is every 24 hours. Reducing this number will increase the number of coil flushes.

Freecooling Flush—Selects how many hours between each free-cooling coil flush cycle. The default is every 24 hours. Reducing this number will increase the number of coil flushes.

Hot Water Flush—Selects how many hours between each hot water coil flush cycle. The default is every 24 hours. Reducing this number will increase the number of coil flushes.

Ball Valve Setpoint Offset—Adjusts the operating compressor discharge pressure by changing the targeted range of control for units with motorized ball valves.

Heaters Outputs as (Liebert HPM only)—Activates the heater digital output based on the selected event on units with no heaters.

CW Valve Control—For units equipped with dual motorized ball valves controlling flow to the chilled water coil, this parameter allows the valves to be set to operate in parallel, alternate or cascade. Parallel is the default selection and operates the valves at the same opening based on the call for cooling.

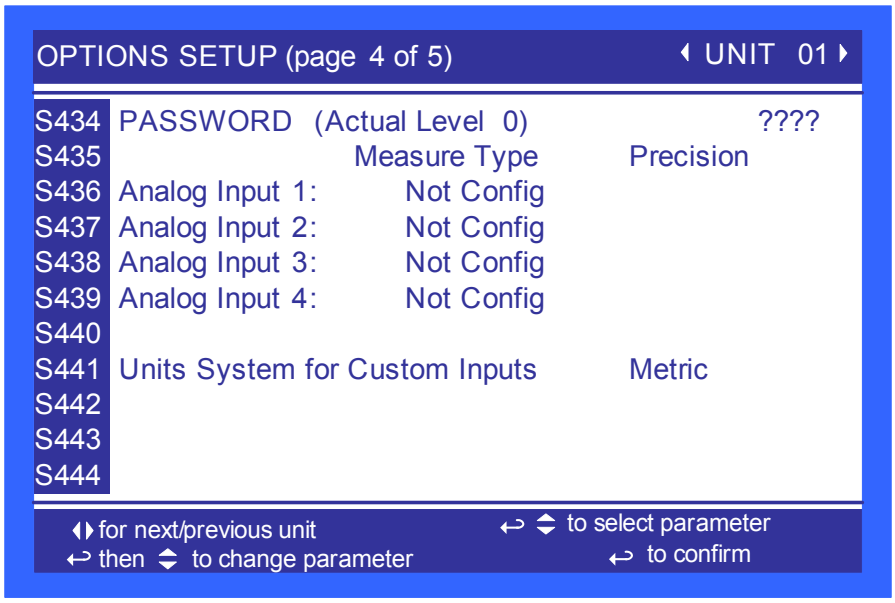
Main Valve—Selects which valve is the lead valve if CW Valve Control is set for "Alternate or Cascade."

Auto Valve Rotation—Allows the valves to be rotated based on the Valve Rotation Hour if CW Valve Control is set for "Alternate or Cascade."

Valve Rotation Hour—Determines the time between the valve rotations if Auto Valve Rotation is enabled.

Dehum Operation—Selects the dehumidification operation of the valves for units equipped with dual motorized ball valves controlling flow to the chilled water coil.

Figure 91 Options setup, page 4 of 5



Measure Type—Determines the measurement units and allowable range for each analog input.

Factory Std measurement type means the input is being used by the PA program for unit control and cannot be set to any other measurement type.

Not Config measurement type means the input is available for custom sensor use, but has not been configured. After unit code execution, all analog inputs that are available will be set to "Not Config," and can then be set to any of the following choices by the user:

- Air Pres 1, 2, 3 or 4
- Pressure 1, 2, 3 or 4
- Temp 1, 2, 3 or 4
- Percent 1, 2, 3 or 4

It is not necessary to match a measurement type number to the analog input number (i.e., "Air Pres 2" does not have to be connected to Analog Input 2). The numeric designation on each measurement type is just to allow the user to differentiate between readouts if multiple measurements of the same type are required.

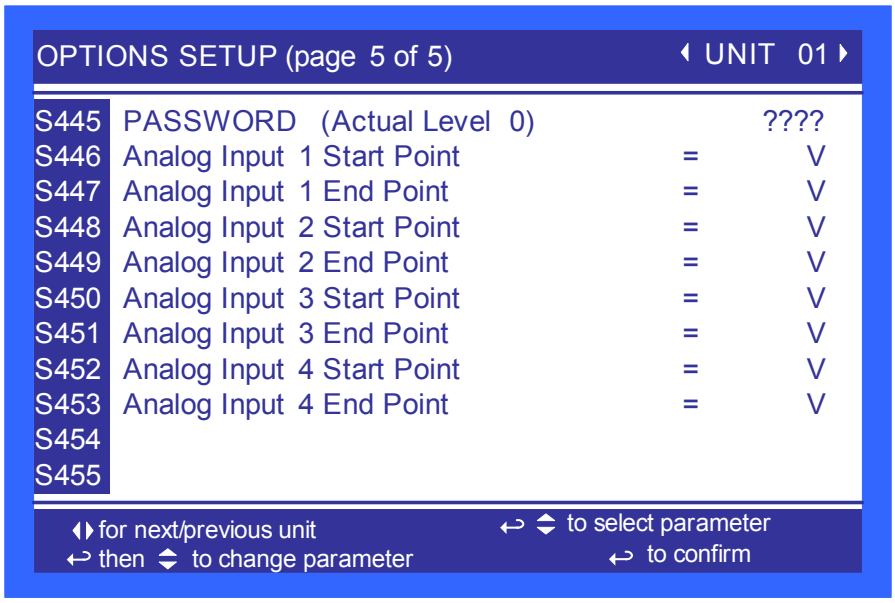
Precision—Parameters in the Precision column must match the DIP switch settings for each analog input being used. There are two choices for these parameters: 0-5V and 0-10V. This setting will also regulate the range of an analog input's linear characteristic on Page 5 of the Options Setup screen of the Service Menu (see **Figure 92**).

Line S441—Determines the unit type (English or SI) that will be used for the setup and readout of custom sensors. This parameter affects only analog inputs. All lines in other menus involving pressures or temperatures will have their readout type determined by line U404 of the User - Selection menu. The table below shows the English and SI units for each measurement type.

Measurement Type	Units	
	English	SI
Air Pres	inWC	Pa
Pressure	PSI	Bar
Temp	°F	°C
Percent	%	%

When the unit type is changed on line S441, the linear characteristics for all of the inputs on Page 5 of the Options Setup screen of the Service Menu will be converted to match the new units system, and the readout in the Sensor Data in the User Menu will also change to reflect the new units.

Figure 92 Options setup, page 5 of 5


OPTIONS SETUP (page 5 of 5)
UNIT 01
S445 PASSWORD (Actual Level 0) ????
S446 Analog Input 1 Start Point = V
S447 Analog Input 1 End Point = V
S448 Analog Input 2 Start Point = V
S449 Analog Input 2 End Point = V
S450 Analog Input 3 Start Point = V
S451 Analog Input 3 End Point = V
S452 Analog Input 4 Start Point = V
S453 Analog Input 4 End Point = V
S454
S455
for next/previous unit
then to change parameter
to select parameter
to confirm

Only characteristics for analog inputs used for custom sensors are visible in this menu.

Start Points, Lines S446, S448, S450 and S452)—Represent the starting point of each analog input's linear characteristic. The column on the left indicates the desired readout at the lowest allowable sensor voltage, and the column on the right indicates the lowest sensor voltage.

End Points, Lines S447, S449, S451 and S453—Represent the finish point of each analog input's linear characteristic. The column on the left indicates the desired readout at the highest allowable sensor voltage, and the column on the right indicates the highest sensor voltage.

The range of allowable voltages is dictated by the Precision selection for that analog output on Page 4 of the Options Setup screen of the Service Menu (see **Figure 91**). If the precision of Analog Input 1 is set to 0-5V on line S436, the voltage selection on line S447 will not be allowed to go above 5.0V.

The range of the readout start/finish points is dictated by the units system selection on line S441. The range for each is shown in the table below.

Measurement Type	Units	
	English	SI
Air Pres	-1.25 to 1.25 inWC	-320.00 to 320.00 Pa
Pressure	-320.00 to 320.00 PSI	-22.00 to 22.00 Bar
Temp	-320.00 to 320.00 °F	-160.00 to 160.00 °C
Percent	-320.00 to 320.00%	-320.00 to 320.00%

Table 17 Service contact information parameters

Function		Range Imperial (metric)
Large Display	**Small Display**	
Page 1 of 1		
Password	PASSWORD	-
Country	Country	None Austria Switzerland D Switzerland F Benelux D Benelux FL Germany France UK Hungary Italy Poland Spain United States Australia New Zealand Indonesia Malaysia Singapore
Address line 1	Address line 1	text-string
Address line 2	Address line 2	text-string
Address line 3	Address line 3	text-string
Address line 4	Address line 4	text-string

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